A McGRAW-HILL PUBLICATION 35 CENTS

THE WELDING ENGINEER

FEBRUARY, 1954

Distributor at right started with a consigned stock, does a $1,000,000 annual volume today. See page 44

Detroit distributor runs research laboratory, invites customers to bring in their welding problems. Page 47

Cylinder control is vastly simplified by a new method of record keeping. Forms used can be seen on page 39

Mike and Maybell Hodes, of Harlingen, Tex., are firm believers in spot radio announcements to farm prospects. Page 42

FEBRUARY 15-17

NATIONAL WELDING SUPPLY ASS'N . . . San Francisco

Newly Developed Fiber Glass Ins
gives longer trouble-free lif
to Jackson Holders

High heat, and, in many cases, high impact, make
the most vulnerable parts of any arc welding electrode
Jackson Products, pioneer manufacturer of insulated elec
has time and again brought out worthwhile improver
the design and composition of holder insulators.

This time, here's the news: Not only the jaw insulato
insulators on the entire line of Jackson Insulated Hol
made of an entirely new thermosetting material, all gl
forced, that exceeds in durability, by a wide margin, a
far used for this purpose.

As a constant check on their quality, we have these ins
ically tested by independent laboratories . . . not just
the same material, but the actual jaw insulators, co
cated, countersunk screw holes and all.

***Compared to the jaw insulators previously used, the
show greater strength under compression, more th
strength under flexure, and more than eight times
under impact. Electric furnace tests at temperature
and 2,000° F. prove that the new Jackson Insulator
shape and their full insulative characteristics at temp
above those normally encountered.***

More good news: These superior insulators are furnished on the holders at no extra cost, and as replacement parts at no increase in price. They still cost less than other makes.

New Holder AW-C with the new insulation, shown in detail above.

Sold World Wide . . . through Distributors and Dealers.

JACKSON
PRODUCTS
WARREN · MICHIGAN

WA
PAG

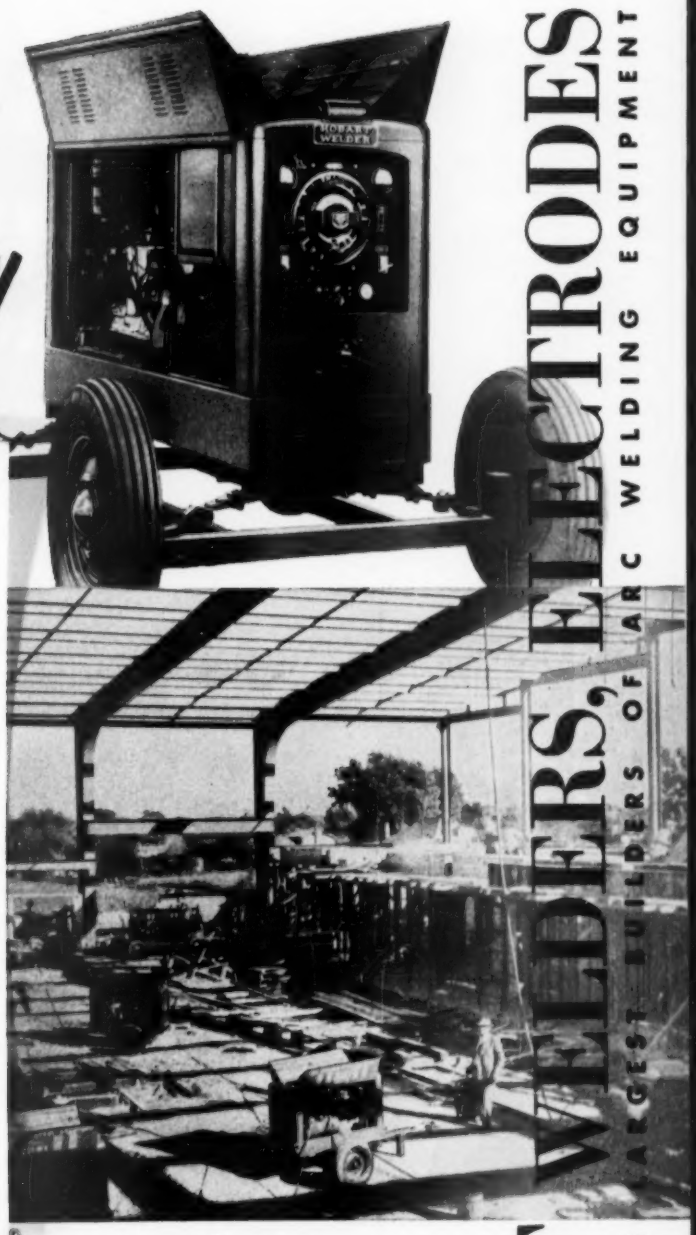
The CARBON ARC TEST is part of continuous quality control at Jackson's Plastics Department. The 1,300° F. heat applied by this method, at a distance of two inches from the test pieces, is comparable to the temperature normally radiated by two-inch electrode stubs.

Hobart's extra welding capacity

(Added turns of extra copper.) ...helps you get

AVY

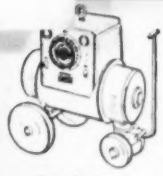
GES



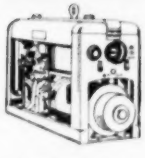
HOBART WELDERS, ELECTRODES
ONE OF THE WORLD'S LARGEST BUILDERS OF ARC WELDING EQUIPMENT

An outstanding electrode for all-around welding

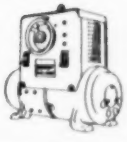
The Hobart "10" is an all-position, general purpose electrode, ideal for pipe lines, structural steel, boilers, tanks, shipbuilding, freight cars, etc. Gives stronger welds, deeper penetration and less spatter.



Electric Drive DC Welder



"Pipeliner" Gas Drive DC Welder



"Bantam Champ" Electric Drive DC Welder

Hobart
brothers company
box U-24, Troy, Ohio
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free!
☐ "HOW TO GET BETTER WELDS." Valuable vest pocket booklet.

HOBART BROTHERS COMPANY, BOX U-24, TROY, OHIO

Without obligation, please send information on items checked.

☐ Gas Drive Welder ☐ Electric Drive Welder
☐ Pipeliner Welder ☐ Bantam Champ Welder

Send me—☐ Electrode Catalog ☐ Accessories Catalog

NAME _____ POSITION _____

FIRM _____

ADDRESS _____

Newly Developed Fiber Glass Insulation gives longer trouble-free life to Jackson Holders

High heat, and, in many cases, high impact, make jaw insulators the most vulnerable parts of any arc welding electrode holder.

Jackson Products, pioneer manufacturer of insulated electrode holders, has time and again brought out worthwhile improvements in both the design and composition of holder insulators.

This time, here's the news: Not only the jaw insulators, but all the insulators on the entire line of Jackson Insulated Holders, are now made of an entirely new thermosetting material, all glass fiber reinforced, that exceeds in durability, by a wide margin, any material so far used for this purpose.

As a constant check on their quality, we have these insulators periodically tested by independent laboratories . . . not just sample bars of the same material, but the actual jaw insulators, completely fabricated, countersunk screw holes and all.

Compared to the jaw insulators previously used, these new pieces show greater strength under compression, more than twice the strength under flexure, and more than eight times the strength under impact. Electric furnace tests at temperatures of 500, 1,000 and 2,000° F. prove that the new Jackson Insulators retain their shape and their full insulative characteristics at temperatures well above those normally encountered.

More good news: These superior insulators are furnished on the holders at no extra cost, and as replacement parts at no increase in price. They still cost less than other makes.

New Holder AW-C with the new insulation, shown in detail above.

Sold World Wide . . . through Distributors and Dealers.

JACKSON
PRODUCTS
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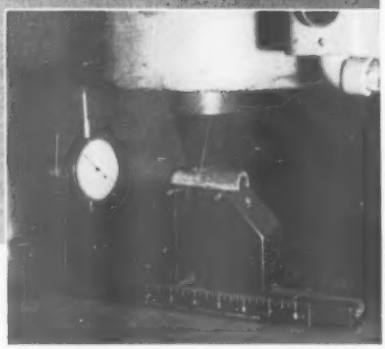
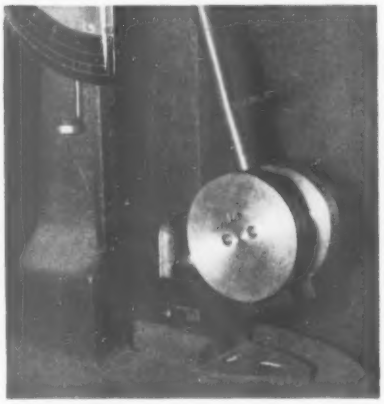
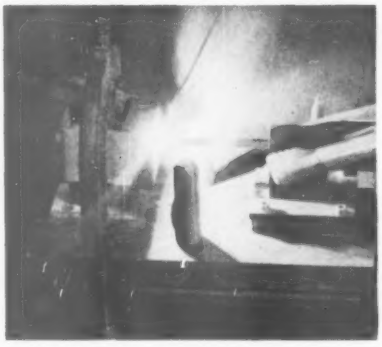


FLEXURE TEST shows insulator, supported two inches apart, with load applied downward at the center.



IMPACT TEST shows insulator, held vertical in vise, about to be hit by pendulum at 16 foot-pounds.



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Hobart's extra welding capacity

(Added turns of extra copper.)

...helps you get more welding per man hour

Advanced engineered Hobart welders are never skimped of quality materials . . . you get constant top performance insuring cooler operation, easier arc control, extra capacity. Hobart simplified arc welders will speed up production and cut costs even on the toughest jobs, and your weldors will be putting out more work with fewer rejects and less effort. If you're looking for a rugged welder that will give better performance at less expense, try Hobart . . . see the difference for yourself.

HOBART WELDERS, ELECTRODES

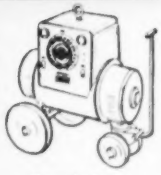
LARGEST BUILDERS OF ARC WELDING EQUIPMENT

ONE OF THE WORLD'S

HOBART No. 10 E-6010

An outstanding electrode for all-around welding

The Hobart "10" is an all-position, general purpose electrode, ideal for pipe lines, structural steel, boilers, tanks, shipbuilding, freight cars, etc. Gives stronger welds, deeper penetration and less spatter.



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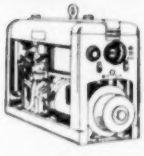
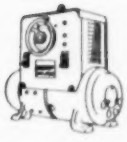


"Pipeliner" Gas Drive DC Welder



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Send me—☐ Electrode Catalog ☐ Accessories Catalog

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FLOWLINE
TRADE MARK
WELDING FITTINGS
Stainless Steels, Monel, Nickel
3000 Stock Items Made by Corrosion-Resistant Specialists
FLOWLINE Welding Fittings are handled throughout the country by leading distributors who sell everything for corrosion-resistant piping —fittings, valves, pipe, and accessories. This phase of our specialization in corrosion-resistant fittings helps users obtain "on-the-job" service — and take fullest advantage of the economy and efficiency of simplified welded construction.
Any corrosion-resistant piping system can be constructed with FLOWLINE Fittings simply by plain butt welding them to straight cut pipe of desired lengths. Initial cost is usually less than that of any other system — welded fabrication with FLOWLINE Welding Fittings permits use of lighter schedules for the same service. The system requires less material, is lighter, can be assembled and put into service faster.
FLOWLINE corrosion-resistant fittings include tees, stub ends, ells, reducers, and caps. All are made of close-grained forged or wrought metals, cold formed by our exclusive process and annealed, which consistently puts the metal in the best condition for corrosion service. These fittings are normally stocked at strategic points in Schedules 10, 40, and 80 (Schedule 5 also available)—sizes ½" through 12" — in stainless steel Types 304, 316, 347; Monel; Nickel.
WELDING FITTINGS CORP.
NEW CASTLE, PENNSYLVANIA
World's Largest Manufacturer of Stainless Welding Fittings

THE WELDING ENGINEER

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VOLUME 39 NUMBER 2

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FEBRUARY, 1954

DISTRIBUTORS

Business Forms Build Business 39
Radio Pays for Gulf Welding 42
Man at Work 44
Laboratory for Welding Sales 47

SALVAGE

Standpipe Moved 50 Miles 48
T. B. Jefferson

RESEARCH

"Grass Roots" of Stress Control 50
Joseph Holt

HISTORICAL

77 Years of Resistance Welding—I 54
Preston M. Hall

OPERATION

Welding with Magnetic Flux 57
R. A. Hand

6 Processes for Fusion Welding of Aluminum 58
Lester F. Spencer

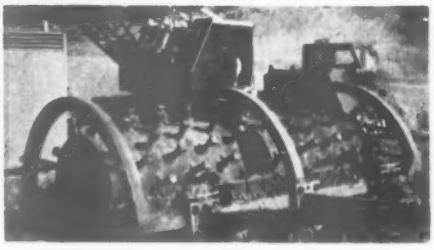
DEPARTMENTS

News 5
Welding Info-Aids 33
Editorial: Are You Wishing or Working? 37
Ket's Cracks Lose Bet 56
Data Sheet No. 161: Cubic Yards in a Conical Tank 69
On the Job 70
Letters to the Editor 72
New Products 74
People 90
30 Years Ago 93
Patents 95
Searchlight 96
Where to Buy 96
Advertisers in This Issue 98

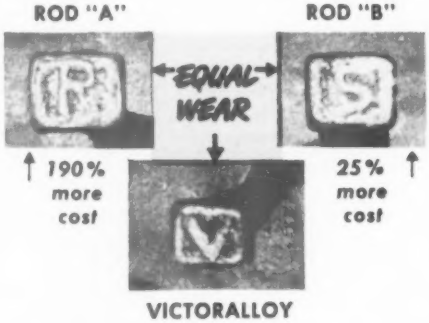
"test it yourself" plan

PROVES VICTORALLOY CUTS HARDFACING COSTS

HERE'S EASY WAY TO MAKE TEST... Hardface an equal number of "feet" on a sheep's foot tamper, as this contractor did, with the different rods you want to test. (You could use bucket teeth or tractor rollers for the test, too). Position test teeth so each sample gets equal wear. Identify each rod by welding a symbol on its test samples.



MAKE A TEST "RUN", then check results. These unretouched photos show what *this* test revealed: equal wear, yet rod "A" cost 190% more, rod "B" 25% more than VICTORALLOY!



VICTORALLOY'S wearing qualities, ease of application and low cost saved this contractor a minimum of 25% in hardfacing cost!

Test VICTOR Hardfacing Rods . . . And Start Saving NOW!

THIS HARDFACING ROD	FOR THESE CONDITIONS	FOR SUCH EQUIPMENT
VICTORALLOY	Abrasion and severe impact	Tractor rollers, dredge pump impellers, bucket lips and teeth, rock crushers, steel mill wobblers
VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTORITE 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTORITE 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

Available in a full range of sizes for both acetylene and electric AC and DC applications, either hand or automatic. Order a supply from your VICTOR dealer today . . . look for this sign.

Dealer Inquiries Invited

VICTOR for welding

VICTOR EQUIPMENT COMPANY 5H

3821 Santa Fe Ave. LOS ANGELES 58 | 844 Folsom Street SAN FRANCISCO 7 | 1312 W. Lake St. CHICAGO 7

AIRBORNE deliveries are made by Texas distributor

YOUNGSTERS were among spectators at welding clinic

NEWS

Welding Supply Association Convention, Feb. 15-17

SAN FRANCISCO will play host for three days to the tenth annual convention of the National Welding Supply Association. The time is Feb. 15-17, the place the Fairmont Hotel.

Program includes talks by President William A. Rice and Secretary-Treasurer Robert C. Fernley, and feature addresses by Dr. Walter A. Dew, manager of E. I. duPont de-Nemours & Co.'s Pacific District public relations department; Hebert A. Miller, of Brown & Bigelow; William Winter; Paul A. Frost, of Dun & Bradstreet.

A panel discussion on members' plans to cut costs and increase net profits in 1954 will be held on Tuesday morning, Feb. 16. Election and introduction of officers and directors will take place on the afternoon of the same day. Members will hear reports from the various committees throughout the three-day session.

An informal reception has been planned for 6 p.m. Tuesday. The annual banquet is scheduled for 7 p.m. that same day and will be followed by dancing.

* * *

Informal NWSA Meeting in Detroit Attracts 30 Members

THIRTY members of the National Welding Supply Association in the Detroit area attended an informal meeting and luncheon in that city recently. J. H. Colwill, of Detroit Gas Products Co., Royal Oak, Mich., presided. Among the speakers were E. C. Caluwaert, of O.K.I. Welding Supply Co.; James N. Alcock, of Saginaw Welding Supply Co.; F. A. Wirth, of National Cylinder Gas Co.

* * *

Houston Distributor Gives Airborne Service

(left photo)

A HOUSTON distributor is offering rapid air service to customers in its large territory. Recently appointed distributors for KSM Products, Inc., Herbert W. Scott, Jr., and Robert H. Simon, of S & S Industries, Inc., pilot a four-passenger plane for speedy deliveries. Their far-flung territory includes Texas, Arizona, Oklahoma, New Mexico and part of Louisiana.

Steel Outlook Good

AT the beginning of this year, the demand for steel was still brisk, and forecasters could see no indication of a substantial setback for the industry, which set a record in 1953. More than 112,000,000 tons of steel were produced in the United States last year.

Although the industry at present is not operating at its full capacity, the output in tons has been high and closely related to actual orders. (At the start of the year, the annual capacity was said to be 124,330,410 net tons of ingots and steel for castings.) There has been a moderate reduction in the demand for steel as compared with a few months ago. But the demand then was unusually high. Using steel as still another gage, 1954 promises to be a good year for U. S. industry.

685 Persons Attend Baltimore Clinic

THE recent welding clinic conducted by Earlbeck & Landrum, Inc., Baltimore, was attended by 685 persons, among whom were a number of eager youngsters, as picture above shows. Older visitors included manufacturers, exhibitors and suppliers, some of whom came from as far away as the West Coast. The clinic and welding show was held in the Baltimore distributor's new combination warehouse and parking garage and lasted two days.

* * *

NWSA Birmingham Meeting Has Record Attendance

ATTENDANCE was at a new high for the southeastern zone of the NWSA when 108 delegates registered for the December meeting in Birmingham. Seven firms applied for membership during the two-day session.

Applicants were: Brooks' Welding Supply Co., Chattanooga; Marks' Oxygen Co., Augusta, Ga.; Nunn's Battery & Electric Co., Inc., Montgomery, Ala.; Scott's Welding Supply Co., Montgomery, Ala.; Standard Portable Cord Co., Inc., Jamestown, N. Y.; Welders Supply & Equipment Co., Montgomery, Ala.; Pensacola Welding Supply Co., Inc., Pensacola, Fla.

Speakers included President W. A. Rice; A. E. Pearson, of Ingalls Iron Works Co., Birmingham; E. C. Caluwaert, of O. K. I. Welding Supply Co., Cincinnati; James H. Gray, editor of the *Albany Herald*, Albany, Ga.; E. A. Clevenger, of Corley Mfg. Co., Chattanooga.

* * *

ASM Meeting, March 4-5

THE mid-winter meeting of the American Society for Metals will be held March 4 and 5 in the Hotel Statler, Boston.

NEWS

from page 5

RAMP for "piggy-back" trucks is of welded magnesium

ELECTRON accelerators will be for use in industry

Welded Ramp Aids "Piggy-Back" Loading

ANOTHER recent equipment development for "piggy-back" movement of highway trailers by railway flat cars is a magnesium ramp of welded construction. The ramp, said to be the largest unit ever fabricated from magnesium, was developed by Magnesium Co. of America, East Chicago, Ind., in conjunction with Brandon Equipment Co., Chicago railway supply and engineering firm.

The ramp is 45 ft long and 9 ft wide, but flares to 11 ft at ground level to permit easy approaches and turns. It weighs 4,300 lb.

* * *

Jersey City Distributor Offers Technical Service

SAID to be the first of its kind, a technical service division has been organized by Garden State Welding Supply Co., Jersey City distributor. The separate division will handle customer problems confidentially and in report form. The service will be offered without charge and will not affect the price of anything a customer might buy.

* * *

75 Delegates at NWSA Southwestern Zone Meeting

DALLAS was the scene on Dec. 10 and 11 of the National Welding Supply Association's southwestern zone meeting. Seventy-five delegates attended the sessions at the Baker Hotel. R. G. Harrison, of Welders Supply Co., Little Rock, zone vice-president, conducted the meeting.

Speakers included President W. A. Rice; H. W. Beutel, of Mosher Steel Co., Dallas; A. C. Willbern, of Dun & Bradstreet, Inc.; O. Sam Cummings, Kansas City Life Insurance Co., Dallas; Frank W. Woodrich, of Texas Instruments, Inc., Dallas.

Discussions were conducted by Thomas J. Kegg, Sr., of Champion Industrial Sales Co., Houston; C. Carl Fitch, of Fitch Welding Supply, Lawton, Okla.; Charles E. Squibb, of Welders Supply Inc., Dallas; Harry R. Shannon, of Capital Welding Supply Co., Little Rock; J. S. Lowrey, of Alamo Welding Supply Co., San Antonio; C. O. Stillwell, of Gulf Welding Equipment Co., New Orleans.

* * *

Westinghouse to Build Metallurgy Plant

CONSTRUCTION of a new metals-development plant is considered by Westinghouse Electric Corp. as a major step in its expanding metallurgical program. The plant will be located at Blairsville, Pa., and is expected to be completed by late 1955. It will be devoted to metallurgical development and pilot production of special alloys and castings.

* * *

Specialty Clinic by Newark Distributor

ONLY two processes—silver brazing and Mig (metal-inert-gas) welding—will be featured in a three-day specialty clinic to be held sometime in March by Essex Welding Equipment Co., Newark. Exact dates will be announced later.

President A. C. Axtell feels there are enough industries within a reasonable distance of Newark to warrant holding this special type of clinic covering only two metal-joining processes.

"Toned-Down" Accelerators for Industrial Use

COMMERCIAL manufacture of electron linear accelerators for use in inspection of industrial products and in cancer therapy will begin soon at the X-ray Department of General Electric Co. They will be junior-size models of Stanford University's billion-volt, super-high-frequency, 200-ft-long accelerator and are expected to be on the market within the next few years.

G-E engineers will spend a year at Stanford studying the design and construction of accelerators. The firm has entered into a ten-year agreement with the school for their manufacture.

These accelerators "shoot" electrons in a straight line through a copper tube at almost the speed of light—186,000 miles per second. The electrons ride surfboard-style on micro-waves produced by klystrons, the most powerful vacuum tubes made. High-voltage X-rays can be produced when a metal target is placed in the beam's path. X-raying metals for flaws is one of a number of uses the accelerators are expected to have in industrial radiography.

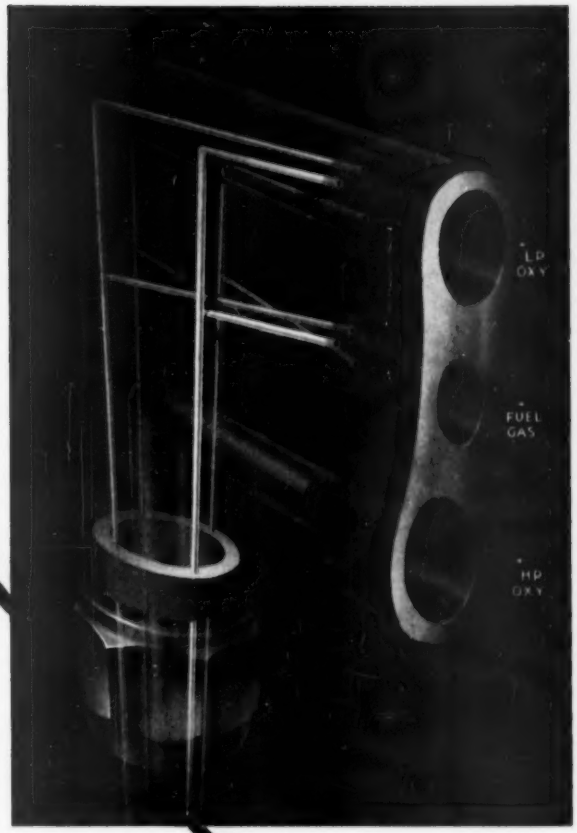
* * *

Victor Acquires Interest in J. C. Menzies & Co.

A SUBSTANTIAL interest in J. C. Menzies & Co., Chicago, has been acquired by Victor Equipment Co., San Francisco, according to L. W. Stettner, president of the California firm. Ground has been broken in Chicago for a modern assembly plant and retail store, which will handle Victor products for the middle west.

(More News on page 84)

this finer cutting torch



multiple mixer in torch head... it offers greater safety and greater efficiency...

A cutting torch mixer may be located either within the torch handle, the torch tubes or the torch head. When located within the handle or the tube, the mixer is situated in close proximity to the operator's hands; no torch, however, need be held by its head.

And, besides, there is plenty of metal in that torch head to permit for an added advantage: Multiple Mixing. By breaking up the streams of the low pressure oxygen as well as the fuel gas into several separate channels, the port diameters are lessened, thus offering greater flash-back resistance.

This modern, patented, Multiple Mixing in the torch head is costlier to manufacture but it eliminates the need for a separate mixer, leaky seats and joints, and years of experience in shop and field have proved the outstanding excellence of this patented design feature.

the mixer is located where it works best...and is safe.

is made by

National of ...california

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

834

Typical Fillet Speeds

Electrode Size	Amps., AC	Fillet Size	Speed, in./min.
3/16"	290	1/4"	15
7/32"	325	5/16"	15
1/4"	395	3/8"	15

Deposition Rates

DH-5			E-6012
Electrode Size	Amps.	Deposit #/hr.	Deposit #/hr.
3/16"	250	6.8	4.5
3/16"	280	7.9	
3/16"	320	9.6	
7/32"	300	9.0	5.8
7/32"	340	10.1	
7/32"	380	12.0	
1/4"	350	11.2	7.0
1/4"	400	12.8	
1/4"	450	14.7	

Try to match this for

You can't — unless you use the . . .

Deposits up to twice as many pounds per hour as an E-6012

That's right, the DH-5 is in a class by itself, when it comes to high welding speed and sound deposits in horizontal and flat positions. It's Harnischfeger's answer to the demand for lower welding costs. It's your answer to the need for faster, better work.

Powdered metal in the coating becomes part of the deposit — increases thermal energy and efficiency. By simply dragging the DH-5, the operator gets the speed and bead appearance ordinarily associated with submerged arc welds.

Wherever they've tried it, weldors like the DH-5. It's fast, it's easy to use. There's no splatter. Slag removal is easy and quick. The bead shape is flat and smooth.

The DH-5 has good, as-welded, mechanical properties, too. See for yourself:

Tensile strength - - -	85,000-95,000
Yield strength - - - -	73,000-77,000
Elongation in 2" - - - - -	15-25%

If you're interested in your cost picture — and who isn't, today?—you owe it to yourself to try the DH-5 without delay. See your P&H representative or distributor now.

For further facts, write for bulletin.

P&H WELDING DIVISION

HARNISCHFEGER CORPORATION

4513 WEST NATIONAL AVE. • MILWAUKEE 46, WISCONISN

the P&H *Line*

2596

high-speed welding!

New P & H DH-5 Electrode

America's most complete line of arc-welding equipment and electrodes

P&H DC RECTIFIER WELDER

Four sizes — 200, 300, 400 and 500 amps (NEMA-rated). No moving coils to break down — no bearings, brushes, commutator, brush riggings, etc., to replace. Dial-lectric Control gives you fingertip heat-control at the work.

P&H AC WELDER

A full range of sizes up to 625 amps (NEMA-rated). All are connectable to 220 or 440 volts. Dial-lectric Instantaneous Remote Control is fingertip control — gives you any heat you want, right at the work.

P&H POSITIONERS

One finger is enough to position heavy weldments for economical downhand welding. Capacities from 2500 to 36,000 lbs. — remote-control and hand-operated models.

P&H WN-250 ENGINE-DRIVEN ARC WELDER

NEMA-rated at 200 amps, but pulls 300 amps. Has full 20-gallon gas tank — runs all day on one tankful. Powered by four-cylinder, 180 GLU, Waukesha, water-cooled gasoline engine.

P&H Welding equipment is manufactured and sold in Canada by

REGENT EQUIPMENT MANUFACTURING COMPANY LTD.

455 King Street West • Toronto, Ontario, Canada

When it's...

miller

. . . you know there's none better!

ARC · SPOT miller GENERATORS WELDERS

miller ELECTRIC MANUFACTURING CO.
APPLETON, WISCONSIN

Weld with Wagner

ENGINEERING *at its finest....*

WAGNER MODEL FF-5
HEAVY DUTY
ELECTRODE HOLDER

DEPENDABLE ECONOMICAL SAFE

Typical of the Excellent design of all WAGNER WELDING PRODUCTS — offering exclusive features for WELDING SATISFACTION.

- **"STREAMLINE" — Low center of gravity trigger for quick — one hand rod release — saving time in production WELDING.**
- **HIGH HEAT RESISTANT — Glass fiber insulation for Jaw covers give greater strength with longer life.**
- **WAGNERLOY — High Arc Resistant copper alloy used in tong members.**
- **CHANNEL CONSTRUCTION — In tong members for more rapid heat dissipation.**
- **SPRING TENSION ADJUSTMENT — for proper rod grip and ease of spring replacement.**

We are proud of our dealer organization which represents the leading welding supply distributors in the country. We suggest that you buy all your welding supplies through a regular welding supply distributor. We believe that he can save you time and money by furnishing what you need when you need it.

Call your welding supply distributor for full information on Wagner Welding Products.

WAGNER MANUFACTURING CO., Inc.

Jackson, Missouri

NICKEL-ARC

FINEST ELECTRODES MADE
for MACHINABLE WELDS
on CAST IRON

IF YOU MAKE, USE, or ASSEMBLE IRON CASTINGS, NICKEL-ARC CAN SAVE YOU TIME, LABOR, and MONEY

Nickel-Arc electrodes are designed especially for smooth, fast welding of all types of cast iron. The weld deposit is sound, crack free without checks or porosity and is machinable in the "as welded" condition.

Nickel-Arc is easy to handle because its special core wire and coating produce a low penetrating, easy-to-control, arc with a smooth steady metal transfer and good wash characteristics. What's more, this special core wire and coating allow a lower amperage range reducing the possibility of hard carbides forming in the area adjacent to the weld.

Find out how Nickel-Arc can help solve your cast iron welding problems. Order a 10 pound can from your Alloy Rods Distributor . . . he has it in 3/16", 5/32", 1/8", and 3/32" diameter. For free literature write Alloy Rods Company, Dept. 22, Lincoln Highway West, York, Pennsylvania.

OVEN FRESH — Packaged in the familiar Alloy Rods red and yellow hermetically sealed metal container, every NICKEL ARC electrode reaches you in "oven fresh" condition.

CHECK THESE NICKEL-ARC FEATURES

- Easy Slag Removal.
- Easy-to-control Arc.
- No Injurious Fumes.
- AC or DC Operation.
- All Position Welding.
- Smooth Bead Contour.
- No Preheating Required.

ALLOY RODS COMPANY

Alloy Rods Co.

GENERAL OFFICES and PLANT • YORK, PENNSYLVANIA

PACIFIC COAST SALES OFFICES and PLANT • EL SEGUNDO, CALIFORNIA

NO FINER ELECTRODES MADE . . . ANYWHERE

WHETHER YOU USE PLASTIC OR METAL FRAMES

Depend on **PENOPTIC**

SPECTACLE TYPE SAFETY GOGGLES

Model 707 — With flexible cable temples.
Model 707S — Side shields; cable temples.
Model 707P — Spatula temples, wire reinforced.
Model 707C — Rocker pads; cable temples.
Model 707R — Rocker pads; spatula temples.

Model 220 — Rocker pads; basic frame for series.
Model 220W — With wire screen side shields.
Model 220C — With clear acetate side shields.
Model 220G — With green acetate side shields.
Model 220L — With leather side shields.

The many combinations of Penoptic spectacle type safety goggles fill the eye protection needs of many industrial operations. Both the plastic and metal frame goggles are constructed to meet the most rigid tests. The clear or green safety lenses exceed all Federal Lens Specifications for protection from impact and glare hazards. All models are quick to win worker acceptance with their distinctive personal appearance, light weight and many other comfort features. Penoptic's manufacturer-to-you distribution lowers your cost of worker protection and assures a closer association with the people directly responsible for product performance.

For Full Information And Prices Write Direct To Pennsylvania Optical Co., Reading, Pa.

Order Direct and Save!

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READING, PENNSYLVANIA
Known For Fine Ophthalmic Products Since 1886

WELDING ARCS NEWS

New G-E Fillerarc Equipment Widely Acclaimed by Industry

Dependable, low-cost operation and wider application praised in new consumable electrode gas-shielded welding equipment

Demand for new G-E Fillerarc equipment for consumable electrode gas-shielded welding is the greatest in G-E Welding history. At the Metals Show, at G-E Distributor demonstrations, and in customer plants, Fillerarc equipment has proved its merit as the leading equipment for this high-speed process.

BURN-BACK AND STUBBING MINIMIZED

Of course customers are amazed by the high speeds of Fillerarc equipment and by how fast operators pick up Fillerarc technique. But their greatest praise is for reduction of burn-back and stubbing problems which plagued operators of other equipment.

WELDER, GUN, WIRE-DRIVE FORM PACKAGE

Ease of operation and minimum trouble are built-in features of new Fillerarc equipment. Here's why:

Fillerarc Welder has a self-regulating generator with a rising volt-ampere characteristic which maintains desired arc length automatically. What's more, you can change wire speed even while you are welding and the current is always right.

Fillerarc Gun pulls wire into gun, permitting the use of smaller wire. Result: you can weld thinner sections than ever before possible.

Fillerarc Wire-drive is powered by a Thy-mo-trol* drive and dynamically braked to give you precise wire-feed control. Dial gives continuous wire-speed indication—no need to time and measure.

If you haven't yet seen Fillerarc equipment in action, contact your G-E Welding Distributor today. He can give you full data and arrange a demonstration. He's listed here and in the yellow pages of your phone book under "Welding Equipment—General Electric." General Electric Co., Schenectady 5, N.Y.

*Reg. Trade-mark of General Electric Company

710-15

P. S.: Your G-E Welding Distributor can furnish filler wire for this process. Ask him for a quotation to your specifications.

Now—a Plastic Ventilated Helmet

The famous G-E ventilated helmet is now available in plastic to give you the last word in comfort, convenience, and long life.

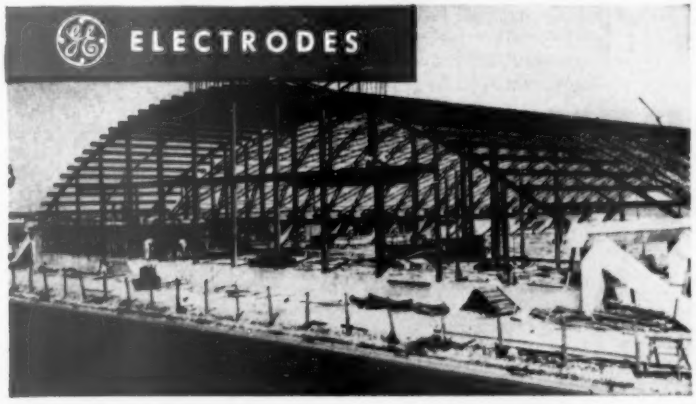
FOR YOUR COMFORT

- G.E.'s famous ventilated design provides a cool head on the job.
- Moisture-proof headgear assumes head shape exactly—but won't warp.
- Ratchet-type device makes exact head-size adjustment simple.
- New four-position stop meets vertical and overhead needs, too.

FOR LONG LIFE

- Seamless plastic construction has excellent strength.
- Plastic shell is moisture-proof and heat-resistant.

Avoid fatigue, get real comfort and convenience on the job with the new G-E plastic ventilated helmet —lift-front or stationary type.



Columbia Iron Works Selects W-612A

In choosing an electrode for shop-welding structural roof joists, Columbia Iron Works of St. Louis was looking for the best available combination of weld quality, speed, and usability.

After tests, they selected G-E Type W-612A electrodes as tops for this job. Columbia is mighty pleased with the results, too, because W-612A helped them complete delivery in 20% less time than originally estimated.

This successful application of W-612A—one of more than 70 arc-welding electrodes supplied by G.E.—is another example of "balanced electrode design for best over-all results."

You'll Find the Best Electrode for Your Job in the G-E Line—Most Complete in the Industry

G-E WELDING DISTRIBUTORS

Alabama: Birmingham—Alabama Oxygen, Young & Vann Supply; Mobile—Turner Supply

Arizona: Phoenix—Consolidated Welding Supply

California: Fresno, Los Angeles, Oakland, Sacramento, San Diego, San Francisco, Ventura—Victor Equipment

Colorado: Boulder, Colorado Springs, Denver, Durango, Ft. Collins, Ft. Morgan, Greeley, LaJunta, Longmont, Pueblo, Sterling—Hendrie & Bolthoff

Connecticut: Hartford, New Haven—Harris Sales & Service

Florida: Hollywood—Florida Gas & Chemical

Georgia: Atlanta, Macon—Welding Supply & Service; Augusta—Marks Oxygen; Columbus—Williams Welding Supplies

Idaho: Boise—Olson Manufacturing

Illinois: Chicago, Moline, Morton, Rockford—Machinery & Welder

Indiana: Evansville—Drillmaster Supply; Ft. Wayne, Indianapolis—Sutton-Garten; South Bend—Perry Welding Sales & Service

Iowa: Des Moines—Machinery & Welder

Kansas: Hutchinson—Kapper Supply

Kentucky: Louisville—Reliable Welding; Paducah—Henry A. Petter Supply

Louisiana: Alexandria, Shreveport—Hughes Oxygen; New Orleans—Consolidated Welding Supplies

Maryland: Baltimore—Arcway Equipment

Massachusetts: Boston—New England G-E Welding Sales Division

Michigan: Detroit—Welding Sales & Engineering; Grand Rapids—Miller Welding Supply

Minnesota: Duluth—W.P.&R.S. Mars; St. Paul—Production Materials

Mississippi: Jackson—Jackson Welding & Supply

Missouri: Kansas City—Hohenschild Welders Supply; St. Louis—Machinery & Welder

Montana: Billings—Valley Welders Supply; Billings, Bozeman, Cut Bank, Glasgow, Great Falls, Havre, Kalispell, Miles City, Shelby, Sidney, Whitefish—Valley Motor Supply; Butte, Great Falls—Montana Hardware

Nebraska: Lincoln—Lincoln Welding & Supply; Omaha—Baum Iron

New Jersey: Kenilworth—Welding Sales Corp.

New Mexico: Albuquerque—Industrial Supply Co., Hobbs—Western Oxygen; Las Cruces, Silver City—Car Parts Depot, Inc.

New York: Buffalo—Welding Equipment Sales; New York—Welding Sales Corp.; Syracuse—Welding Engineering & Equip.

North Carolina: Charlotte—Dixie Gases; Gastonia—Gastonia Motor Parts

North Dakota: Bismarck, Fargo—Acme Welding Supply

Ohio: Akron, Cincinnati, Cleveland, Columbus, Dayton, Mansfield—Burdett Oxygen; Toledo—Odland Iron Works

Oklahoma: Tulsa—G-E Welding Sales Division

Oregon: Eugene, Portland—J. E. Haseltine; Medford, Portland—Industrial Air Products

Pennsylvania: Allentown, Philadelphia, Pittsburgh—Arcway Equipment

South Carolina: Columbia, Greenville—Welding Gas Products

South Dakota: Deadwood—Hendrie & Bolthoff

Tennessee: Chattanooga, Knoxville, Nashville—Welding Gas Products; Memphis—Delta Oxygen

Texas: Abilene—M&M Welding Supply; Alice, Corpus Christi—Crane Welding Supply; Alpine, El Paso, Marfa, Pecos—Car Parts Depot; Amarillo—Welding Equipment & Supply; Brownsville, Harlingen—Acetylene Oxygen; Dallas—Hill Equipment & Supply; Hereford—Tex-Air Gas; Houston—G-E Welding Sales Division; Lubbock—Welders Supply of Lubbock; Midland—West Texas Welders Supply; Odessa, Pecos—Western Oxygen; Pecos—Welding Supply Co.; Plainview—Plains Welding Supply; San Angelo—Southwestern Welding Supply; Texarkana—Hughes Oxygen; Wichita Falls—Nortex Welding Supply

Utah: Salt Lake City—The Galigher Co.

Washington: Seattle, Spokane—J. E. Haseltine; Spokane, Yakima—Industrial Air Products

West Virginia: Bluefield—Bluefield Supply; Charleston—Virginian Electric; Huntington, Logan—Logan Hardware & Supply

Wisconsin: Milwaukee—Machinery & Welder

Alaska: Anchorage—Northern Supply

Canada: Tornoto—Canadian G.E.

Hawaii: Honolulu—American Factors, Ltd.

GENERAL ELECTRIC

HAND PROTECTION

"Here's a swell welder's glove, Joe!"

Yes, it's

AO HEAVY DUTY HORSEHIDE

Best for Flexibility, Heat Resistance, Wear

"Shake hands" with AO's "super" line of hand protection for welders. Each glove and mitten is 14" long . . . has a smooth finish . . . improved heavy weight soft lining on back for greater protection . . . quality edges bound with tape and stitched. These are features which make this chrome-tanned *horsehide* line better than ever. Test them on the job. *See* the difference! *Feel* the difference! Your nearest AO Safety Products Representative can supply you.

TX100 Gunn cut—one piece back. Double thickness of leather on first finger and thumb, also on portion of palm. Lined on back from wrist to finger-tips.

5X163 Gives exceptional resistance to heat on gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams. Extra heavy lining on back of hand.

TX200 Gunn style. Standard size (11) also sizes 10, 12. Welted seam at base of palm and wrist. One-piece back. Wing thumb.

6X141 One-piece back and palm. Crotch of thumb reinforced with wide leather strap. All vulnerable seams welted for extra protection. Back of hand is lined.

Also ask to see and *feel* the other six gloves and mittens in this top quality AO line.

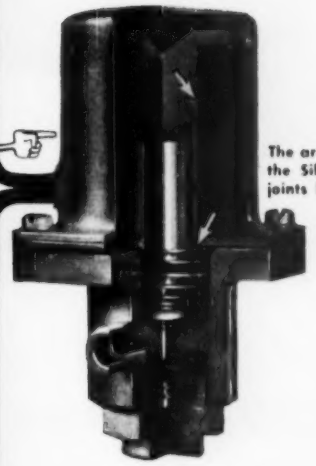
American Optical

SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

SUCCESSFUL BRAZING WITH SILVALOY

LOW TEMPERATURE SILVER BRAZING ALLOY



The arrows point to the Silvaloy-brazed joints in this interior view.

The successful manufacture of electromagnetic units such as solenoid valves calls for the reliable standards of engineering and precision production that have ranked the McQuay-Norris name high on the list of manufacturers of industrial components.

The cut-away illustration is an interesting view of a McQuay-Norris Solenoid Valve. Two interior points that are brazed successfully with Silvaloy and APW Flux are shown on the sectional area.

Low-Temperature Silvaloy Brazing is helping to gain dependable brazing results, fast and simplified production at lowest possible cost, for manufacturers in many fields. Call the Silvaloy Distributor in your area for complete data or for expert technical assistance. ★ ★ ★ ★ ★ ★ ★ ★

McQUAY-NORRIS MANUFACTURING COMPANY are the Manufacturers of this solenoid valve.

FREE! SEND FOR THIS COMPLETE GUIDE TO LOW TEMPERATURE BRAZING

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EAGLE METALS COMPANY
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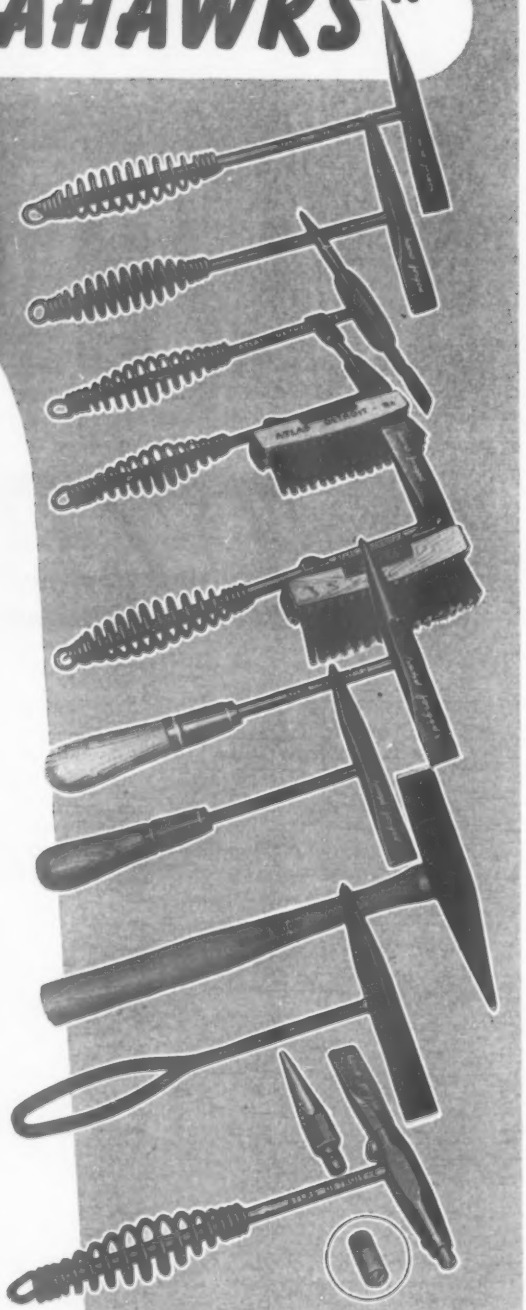
THE AMERICAN PLATINUM WORKS

APW

231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY

"ATLAS TOMAHAWKS"

WH-20
WEIGHT 14 ozs.
LENGTH 11"



Featured above is one of 3 new WH Models, each with a different head style. Like all Atlas Tomahawks WH-20 is tough, has balance and endurance. For those who prefer wood handle tools, there's nothing better. Ask your Dealer for Form WCF32A describing all 28 models of Atlas Tomahawks.

PROVED PRACTICAL ATLAS WELDING ACCESSORIES

Atlas WELDING ACCESSORIES CO.

707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

REXWELD extends SERVICE LIFE of Hartig extruder feed screws by 400%

Here is a typical case of how REXWELD Hard Surfacing Rods are used to extend tool and product life . . . to provide a better, crack and porosity free surface that wears longer.

One of the most important parts of the plastic extrusion machines made by the Hartig Engine and Machine Company is the *feed screw*. This part propels heated plastic through an extrusion die under great pressures, and at rates as high as 2000 pounds per hour. Because the slightest amount of wear on the screw is so critical — on some jobs more than 0.010″ means replacement — Hartig hardfaces them with REXWELD C by the oxyacetylene process.

The Hartig people have found that REXWELD C extends the life of the screws 400% over unsurfaced screws . . . provides a surface that resists abrasion and corrosion . . . and gives them a dense facing free from surface imperfections — an important factor from the standpoint of product contamination.

Next time you have a hard surfacing job which requires the best in service life and ease of application, ask for REXWELD Hard Surfacing Rods. They are available in many different grades and sizes, and in electrodes bearing the special REXWELD low hydrogen coating.

CRUCIBLE

54 years of Fine steelmaking

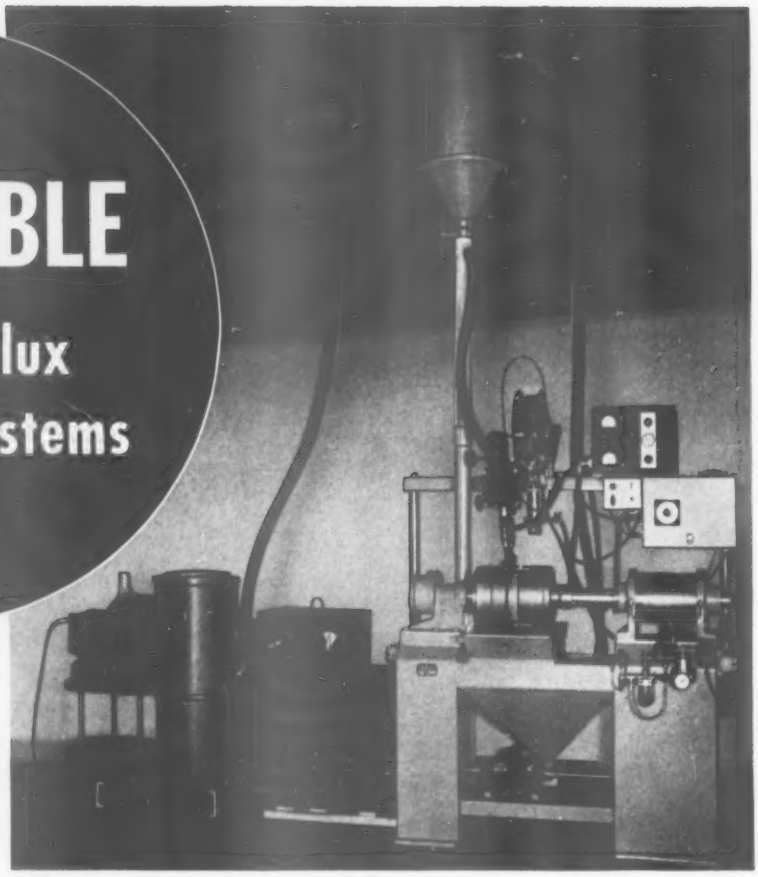
REXWELD HARD SURFACING ROD

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REZISTAL STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

INVINCIBLE

Welding Flux Recovery Systems



This compact set-up includes a primary separator tank and standard Model 460 unit. Compressor parts for a large refrigerator manufacturer are being welded.

Pay for themselves . . . with interest!

Thousands of Invincibles are at work throughout industry . . . salvaging valuable welding flux, saving labor, making the welding operation more efficient. Invincibles repay their cost in a short time, then pay an additional service bonus.

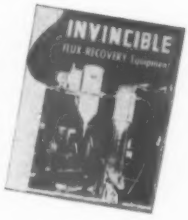
If you have a submerged arc welding job, consider these features of Invincible Flux Recovery Units:

1. Invincibles save valuable flux by recovering *all* loose flux from the work, removing slag or fused particles, and returning the unfused flux to the hopper of the welder. Both manual units and completely automatic (continuous flow), systems are available.

2. Invincibles save costly man-hours—release men for other important work. Invincibles do the job automatically, more rapidly and efficiently than manual methods.

3. Invincibles save you money caused by rejects; by removing all fine dust (flux flour), they speed production and reduce welding rejects.

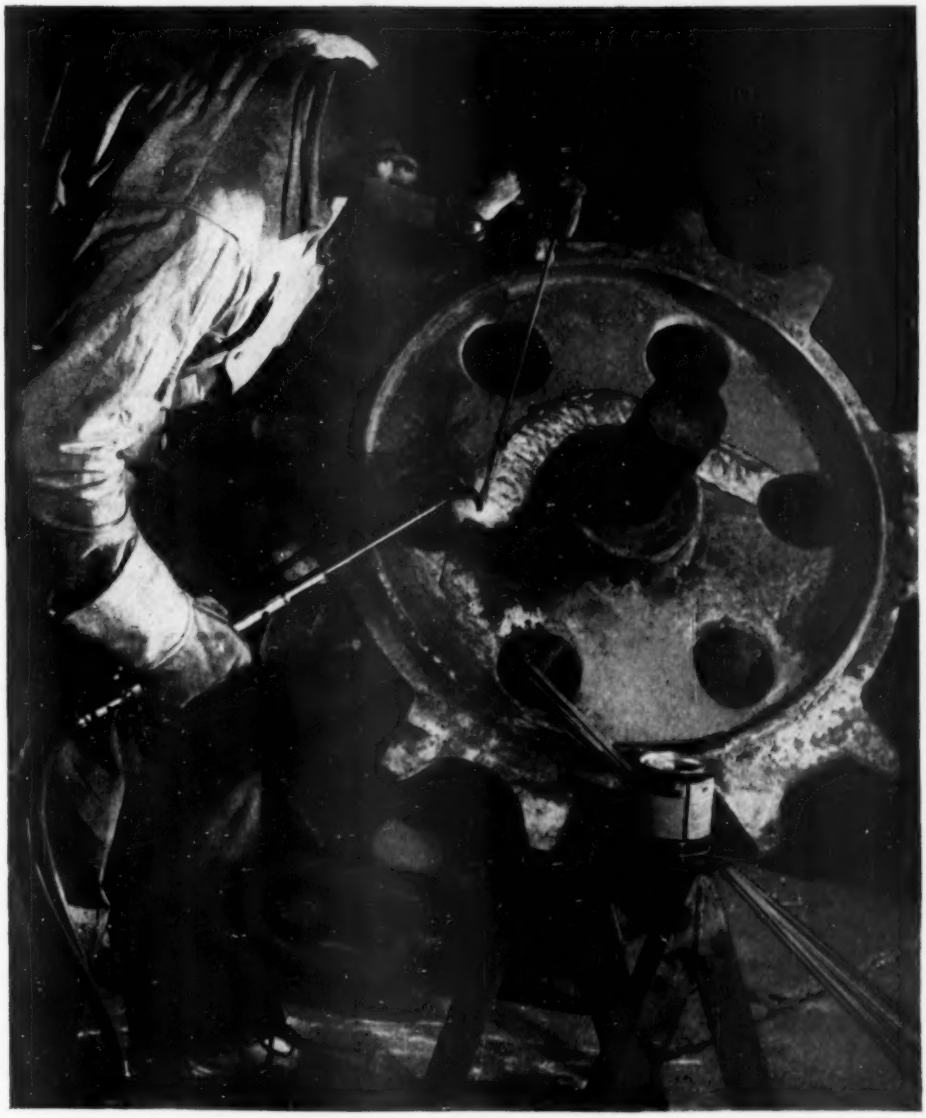
These Invincible advantages can be applied to your job, regardless of its size or type. Let us send you this *Free Folder* on Flux Recovery. Illustrated case histories show how Invincibles save time and money on installations of all kinds.



INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT



CONVEYOR DRIVE SPROCKET that was repaired by braze welding with ANACONDA-997 (Low Fuming) Bronze Rods in only 7 hours. Braze welds made with these rods are clean and strong . . . require little finishing.

SAVED: one expensive drive sprocket *plus* 53 operating days

Replacement of this fractured conveyor drive sprocket would have meant a two-month wait for delivery . . . and considerable expense to its smelting-plant owners. An inexpensive braze-weld repair had it back in operation in a matter of days. Job time was only 7 hours—4 in preparation, 3 in welding. Twenty pounds of 3/16" and 1/4" ANACONDA-997 (Low Fuming) Bronze Welding Rod were used.

Owner Walter Shanowsky, Universal Welding Co., Rochester, N. Y., reports that ANACONDA-997 (Low-Fuming) Bronze Rod gave a fast, sound weld. These rods 'tin' readily, flow freely and have good tensile strength. They melt at relatively low temperatures . . . work requires less preheating, so danger of warping or cracking is minimized.

Universal buys all its ANACONDA Welding Rods from the Welding Supply Corp. in Rochester. ANACONDA Welding Rods for almost every type of repair and production job are available from distributors throughout the United States and Canada. For latest tips on welding, write for Publication B-13 to: *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.* 53166

braze or weld with confidence...

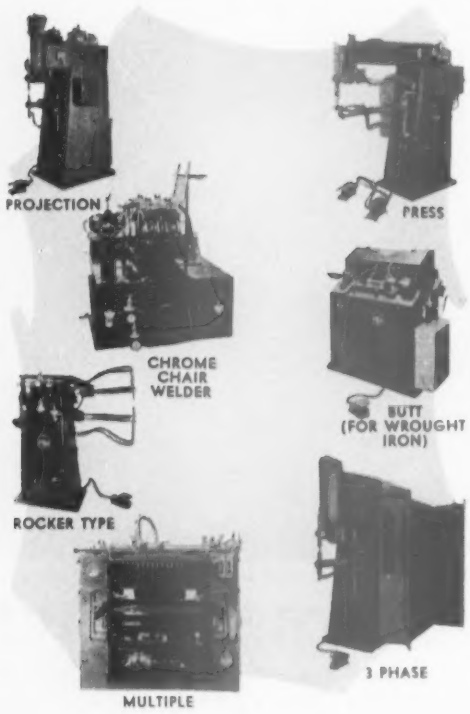
ANACONDA®

welding rods

AMES CUTS

AND INCREASES

TYPICAL AMES
SPOT WELDERS



IF YOU HEARD PEOPLE YOU KNOW SAY —
THE AMES SPOT WELDER COMPANY . . .

. . . helped increase their volume of production

. . . lowered operating costs

. . . which doubled their profits over old methods

Wouldn't you feel that in all fairness to yourself and to your future, that you should at least give the Ames Company an opportunity to prove the same for you?

We are constantly engaged in product applications. This includes not only welding and processing techniques, but cooperation with customers in the solution of everyday welding problems.

So, if you have a welding problem consult with us. Our engineers will be glad to cooperate all the way. They may have an operational suggestion, or select for you an analysis or processing that will save you money.

This is part of our business. It will cost you nothing and will certainly repay you well.

IF YOU MAKE ANY WELDED PRODUCT—

Use AMES ENGINEER

WELDING COSTS

YOUR PROFITS

bringing to you

- 30 YEARS KNOWHOW
- A STAFF OF SPECIALISTS
- A HALF MILLION DOLLAR PLANT

at no cost to you

ATTENTION
MANUFACTURERS
WROUGHT IRON
TUBULAR AND
WIRE PRODUCTS

LOW COST
PATENTED METHOD
OF
WELDING

Eliminates costly brazing, arc welding and bolted joints.

NO CHIPPING
NO CLEAN UP
NO TOUCH UP

PUBLICLY ACCLAIMED BY TOP INDUSTRIES

SINCE 1923
Ames Welder

ASK US — WE HAVE THE ANSWERS FOR RESISTANCE WELDING

1. PROJECTION WELDING
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9. CHROME TUBE
10. ALUMINUM
11. SPECIAL PURPOSE WELDERS
12. PORTABLE WELDERS
13. ELECTRODES AND TIPS

ING SERVICE

Ames Spot Welder Co., Inc.
1328 58th St., Brooklyn, N. Y.

Have Local Rep. Call ☐

Gentlemen:

Please send without obligation on our part, what you have to offer. We want facts on (circle numbers desired).

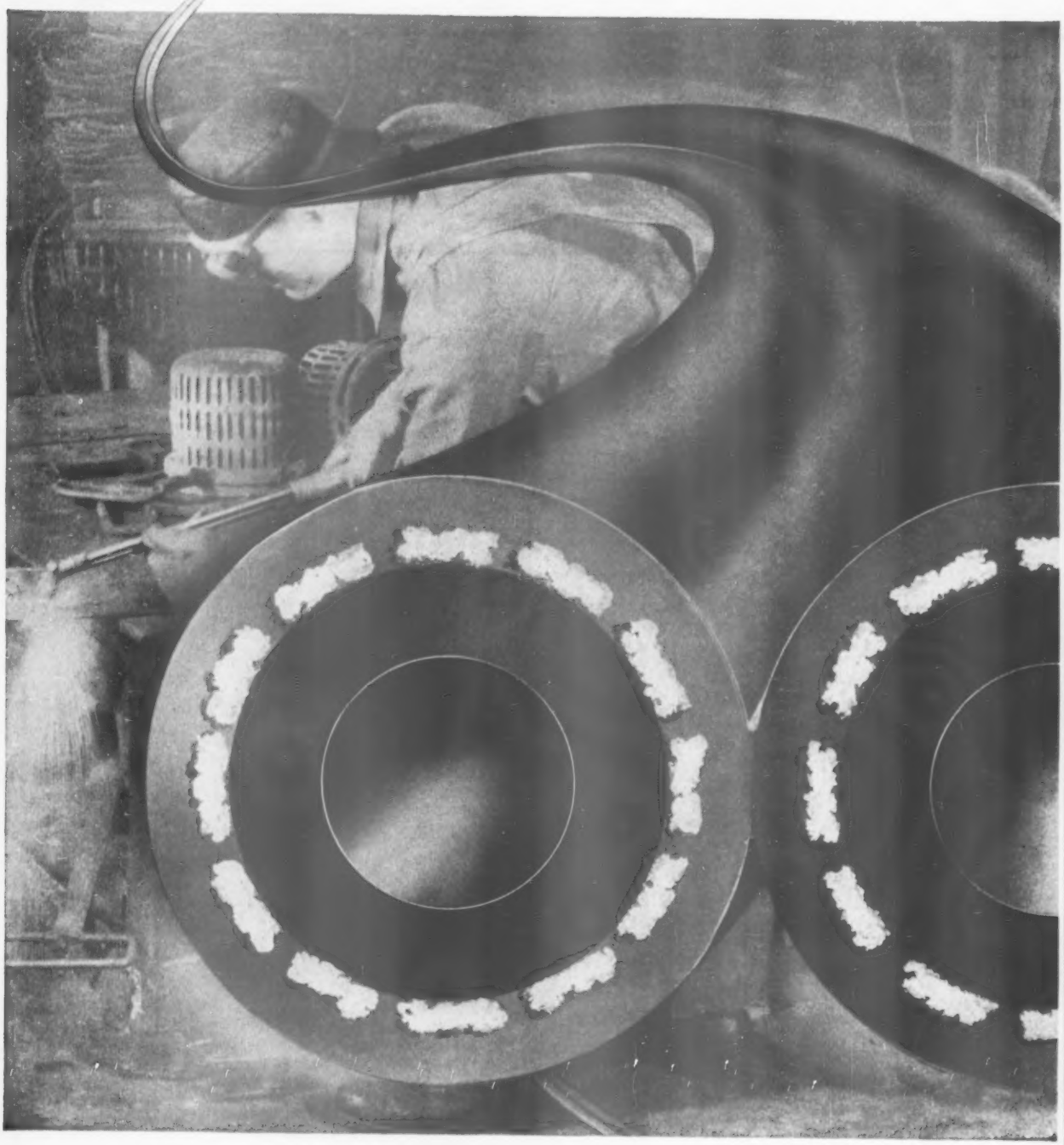
1 2 3 4 5 6 7
8 9 10 11 12 13

Company name .....

Individual ..... Title .....

Address .....

New Twin-Weld . .



HEWITT-ROBINS

EXECUTIVE OFFICES, STAMFORD, CONNECTICUT

. . . Now Better Than Ever

New Cover Compound, Rayon Reinforced, Now Made to IAA Specifications

Twin-Weld—the original twin line welding hose—is now three ways better. It's safer . . . stronger . . . IAA approved.

Be safe, be sure, get greater hose life and handling ease . . . choose the welding hose preferred by over 7 out of 10 . . . Hewitt-Robins Twin-Weld.

ENGINEERING DATA

TUBE: Non-porous, smooth tube for full free-flowing of gases at all times.

CARCASS: Now reinforced with a single braid of high-tensile rayon yarn, applied with special braiding equipment . . . equal in strength and fabric content to the highest quality two braid hose.

COVER: New flame-resistant, oil-resistant cover made from premium quality synthetic compound that won't become hard or brittle. Surface is smooth . . . won't crack, peel or discolor . . . resists abrasion of sharp metal, heat, grit and dirt. For quick, positive identification oxygen line is green—acetylene line is bright red.

SIZES: O.D.'s now conform to IAA specifications—7/16", 17/32", 19/32" . . . I.D.'s 3/16", 1/4", 5/16".

WORKING PRESSURES: Up to 200 psi.

Here is a partial list of
HEWITT-ROBINS PRODUCTS
that will help you cut handling costs and increase operating efficiency.

MACHINERY

Belt Conveyors
Belt & Bucket Elevators
Car Shakeouts
Conveyor Idlers
Dewaterizers
Mechanical Feeders
Foundry Shakeouts
Mine Conveyors
Reclaiming Systems
Screen Cloth
Stackers & Trippers
Vibrating Conveyors & Screens

INDUSTRIAL RUBBER PRODUCTS

BELTING:

Conveyor
Elevator
Transmission

HOSE:

Acid
Air & Air Drill
Barge Loading
Dust Suction
Fire
Fuel Oil & Gasoline
Gasoline Pump
Mud Pump Suction
Oil Suction & Discharge
Propane-Butane
Road Builders'
Rotary Drilling
Sand Blast
Sand Suction
Sea Loading
Servall®, All-Service
Steam
Tank Car & Tank Truck
Vacuum & Air Brake
Water & Water Suction
Welding, Twin-Weld®

•

For information and service on industrial rubber products, contact your Hewitt-Robins Industrial Supply Distributor. Through his complete stock of Hewitt-Robins Rubber products, and his familiarity with local field conditions, he can fill your supply needs promptly and correctly. See Classified Phone Book for the Hewitt-Robins Industrial Supply Distributor serving your area.

294

INCORPORATED

DOMESTIC DIVISIONS: Hewitt Rubber • Robins Conveyors • Robins Engineers • Restfoam
FOREIGN SUBSIDIARIES: Hewitt-Robins (Canada) Ltd., Montreal • Hewitt-Robins Internationale, Paris, France • Robins Conveyors (S. A.) Ltd., Johannesburg • **EXPORT DEPARTMENT:** New York City.

INTRODUCING

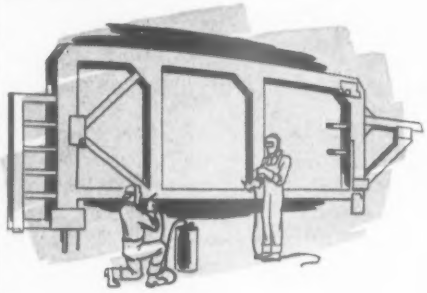
SPEEDEX

the new MUREX® "Contact" Electrode

— crowning achievement in the use of powdered metal in Murex electrode coatings over the past twenty years.

● *Very high deposition rates—up to 25% higher than regular mild steel electrodes—effects real savings in welding costs.*

● *Easy to use—employ drag technique if desired, or use free arc as with conventional electrodes.*



● *Smooth, steady arc on A-C or D-C—little spatter—easy slag removal.*

● *Strong clean welds—85,000 to 90,000 psi tensile with 15% to 20% ductility—good surface appearance—fine ripple—practically no undercutting.*

METAL & THERMIT CORPORATION
100 East 42nd St., New York 17, N. Y.

Gentlemen:
Please send me technical data on "SPEEDEX". ☐ We would like to see "SPEEDEX" demonstrated. Call us for a convenient time. ☐

*NAME*_____ *TITLE*_____
*FIRM*_____
*STREET ADDRESS*_____
*CITY*_____ *ZONE*_____ *STATE*_____

METAL & THERMIT CORPORATION
100 East 42nd Street, New York 17, N. Y.

MUREX ELECTRODES • ARC WELDERS • ACCESSORIES

YOU name the job and BURDOX will supply the correct equipment to do it

ARC WELDING EQUIPMENT

SHAPE CUTTING EQUIPMENT

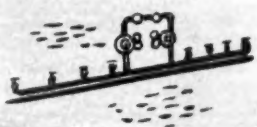
GAS WELDING EQUIPMENT

SOLDERING AND BRAZING EQUIPMENT

SPOT WELDING EQUIPMENT

ACCESSORIES

MANIFOLD EQUIPMENT



SAFETY EQUIPMENT

...BEST...FASTEST...AT LOWEST COST!

There's one undeniable reason why BURDOX can help you do any welding or cutting job the best and fastest way...at the lowest cost. BURDOX puts at your disposal ALL the different methods of doing the job. We have no "axes" to grind, no reason to prefer one process over another...except that it does your job better, faster and at lower cost than any other way. We offer all the different methods...have experience with all the different processes...and know the advantages and disadvantages of each. Moreover we can supply the correct accessories to match the process and protect the worker. With all these advantages at your disposal at no extra cost, you'll find that it pays many times over to check with BURDOX first on any of your cutting or welding needs. Catalog available on request.

BURDOX

EVERY PRODUCT and EVERY PROCESS TO FIT EVERY PURPOSE BEST...

- industrial gases
- gas welding and cutting equipment
- arc welding equipment
- safety equipment

THE BURDOX OXYGEN CO.
GENERAL OFFICES: 3303 LAKESIDE AVENUE, CLEVELAND 14, OHIO
BRANCHES
AKRON CINCINNATI
COLUMBUS MANSFIELD
PLANTS
CLEVELAND, DAYTON & YOUNGSTOWN, OHIO
LOS ANGELES, CALIFORNIA

THERE'S A RIGHT SYLVANIA ROD...

FOR EVERY INERT GAS WELDING JOB

As every welder knows, you can't use the same electrode on every job. For best performance and longest electrode life, you must select the right rod for every particular purpose.

This is why Sylvania offers 3 *different* tungsten electrodes to meet the full range of requirements of any inert gas arc welding work.

Sylvania . . . a pioneer in tungsten

Sylvania is a pioneer in the development of tungsten in many forms. As a result, our engineers and metallurgists have provided the precise type of tungsten rod for every need. Sylvania's research and advanced techniques in manufacture and quality control . . . from ore to finished product . . . assure minute-saving operation and dollar-saving dependability.

Either Sylvania Puretung, Thoriated Tungsten or Zirtung Electrodes will answer any inert gas welding problem you have. So, order the types you require from your nearest Sylvania Welding Distributor today, or write to: Sylvania Electric Products Inc., Dept. 4T-4502, 1740 Broadway, New York 19, N. Y.

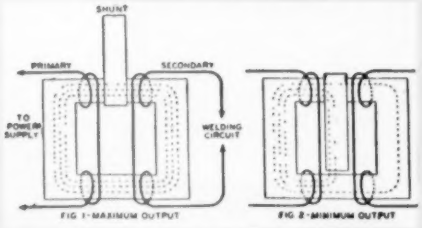
SYLVANIA

LIGHTING · RADIO · ELECTRONICS · TELEVISION

In Canada: Sylvania Electric (Canada) Ltd.
University Tower Bldg., St. Catherine Street, Montreal, P. Q.

Outstanding Before... Even Better Now

The exclusive Sureweld four-coil transformer design



The heart of the Sureweld is an exclusive 4 coil transformer that provides "long" inductive coupling, high inherent reactance, and uniformly fine welding performance. A movable core section provides stepless current control.

Sureweld A-C SHOP WELDER IMPROVED IN MANY WAYS

The Sureweld A-C Shop Welder, for general utility welding, has always been outstanding for the remarkable arc stability it has provided, the desirable welding characteristics at all current levels and the operator's control of current value.

And now this welder has been greatly improved. The exclusive, patented 4 coil transformer has been positioned horizontally for even better ventilation and cool operation even with higher output. Primary and secondary windings are double glass-insulated (Class B) magnet wire providing higher dielectric for peak performance at high heats. Operator's convenience has been increased by side-mounting the control handle next to the high-visibility calibrated scale. Other advances markedly decrease KVA input and increase ease of operation, dependability and portability. Best of all, the improved design has resulted in lower prices.

We'd like to send you our new bulletin describing the improved Sureweld Shop Welder in more detail, or demonstrate the welder conclusively in your own shop. Available in Model S-18C, range 20 to 180 amps., and Models S-30 and S-30C, range 25 to 295 amps. Use the handy coupon now.

NATIONAL CYLINDER GAS COMPANY

840 N. Michigan Avenue, Chicago 11, Illinois

Branches and Dealers from Coast to Coast

NCG
EVERYTHING FOR WELDING

WRITE TODAY

National Cylinder Gas Company,
840 N. Michigan Ave., Chicago 11, Ill.

☐ **Send me Bulletin NH-101 on the new Sureweld Shop Welders, for general utility welding, described above.**

☐ **Send me information on the Sureweld heavy-duty Industrial Welders for production welding.**

NAME _____ POSITION _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

New RA Welder means greater welding performance

Rectifier welder pioneered by Westinghouse now provides many added advantages

Here is the *all-new* RA Welder, truly the finest, fastest and easiest, *any* position, d-c welding machine on the market. Westinghouse, the pioneer in rectifier type d-c welding equipment, has incorporated in the new welder all the engineering know-how and years of "on-the-job" welding performance needed to make the "RA" a *proved performer*. The exclusive features alone —Arc-Drive Control, Built-in Automatic Overload Protection, Single-Range Stepless Current Control— set new quality and performance standards for the welding industry.

Take the Arc-Drive Control for example: This exclusive Westinghouse feature provides an extra "push" to the metal as it leaves the electrode and moves toward the welding surface. This extra "push" assures greater weld penetration. In addition, the Arc-Drive Control enables the operator to quickly and easily adjust the arc-drive current to fit the needs of the particular job.

Another feature is the new "on-off" switch—the AB De-ion® Circuit Breaker. This circuit breaker provides positive and automatic protection against excessive overheating, yet permits harmless temporary overloads without interrupting production.

A rugged frame and a *Bonderized* sheet-steel case enclosure provide maximum protection for both indoor and outdoor operation.

Superior ventilation combines the use of natural air flow and a fan powered by a dependable, nonreversible, totally-enclosed, 1/8-hp motor with prelubricated ball bearings. Specially designed air ducts within the unit provide for free and dependable passage of cooling air—this means longer life.

Features like these—the result of years of experience in producing rectifier welders—put the Westinghouse RA Welder ahead of other types of d-c welding equipment. Get all the reasons why the Westinghouse RA Welder is the best buy. Ask your Westinghouse representative for full details, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

COUNT ON THESE DEFINITE ADVANTAGES

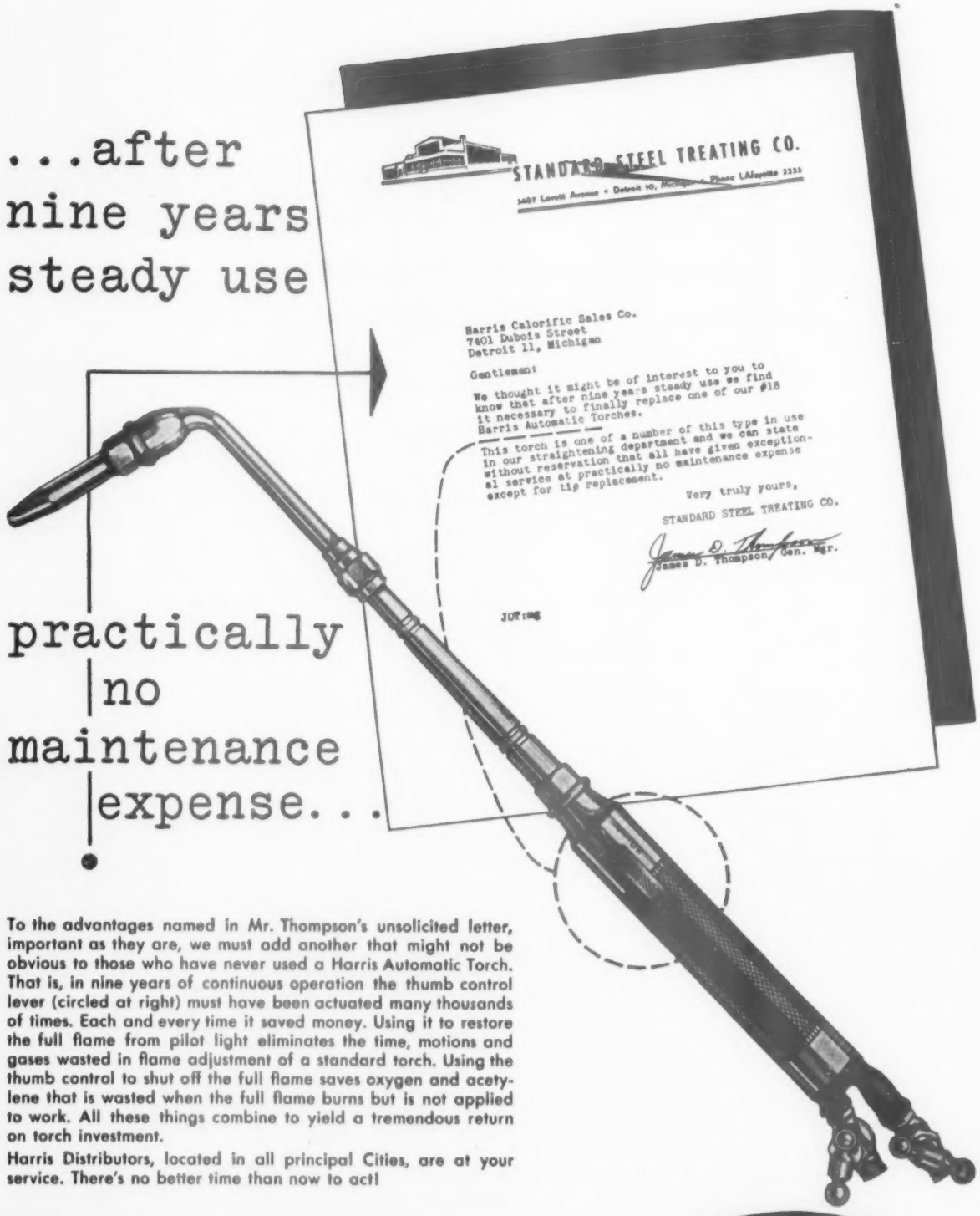
- **ARC-DRIVE CONTROL** provides for greater weld penetration.
- **SINGLE-RANGE, STEPLESS CURRENT CONTROL** allows infinite number of current settings with single-dial adjustment.
- **THERMAL OVERLOAD PROTECTION** is provided by an automatic circuit breaker.
- **SUPERIOR VENTILATION** affords greater natural cooling . . . longer winding life.
- **WEATHERIZED CONSTRUCTION** offers maximum indoor and outdoor weather protection against snow, rain, water and the most rugged of operating conditions.
- **QUIET OPERATION** means less operator fatigue and provides longer machine life through elimination of moving parts.

J-21835

YOU CAN BE SURE...IF IT'S Westinghouse

...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905

An Old Ship

RETURNS TO INDUSTRY

Quietly and without histrionics, the career of an old luxury liner comes to a useful end under the slashing flames of oxyacetylene cutting torches. Scrapped at Seattle, the former Munson liner SS Southern Cross provided more than 9,000 tons of steel for remelt. The vast quantities of oxygen and acetylene consumed during the scrapping of the Southern Cross created scarcely a ripple in the pool of Air Reduction's resources. How large are *your* needs?

AIRCO

OFFICES AND DEALERS IN MOST PRINCIPAL CITIES

AIR REDUCTION

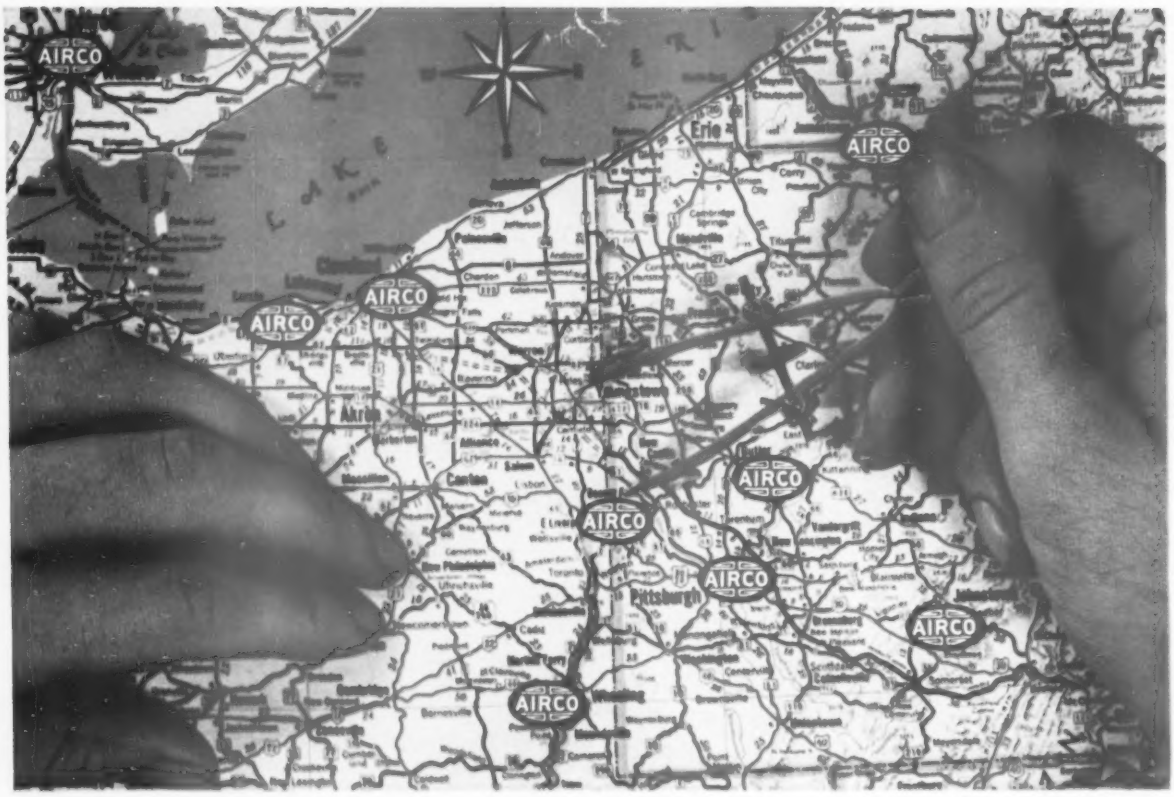
60 E. 42nd Street • New York 17, N. Y.

Air Reduction Sales Co. Air Reduction Magnolia Co. Air Reduction Pacific Co.

Represented Internationally by Airco Company International

Divisions of Air Reduction Company, Incorporated

Gases for the scrapping were piped into the ship from an oxygen trailer set-up and a twenty-cylinder acetylene manifold planned, and installed at the site, by Airco Technical Service personnel. Airco bulk delivery trucks provided the reliable and flexible supply needed during the job.



Each Airco trademark in the section illustrated represents an oxygen *manufacturing* plant. Additional bulk storage is maintained at many other points.

AIRCO OXYGEN AT YOUR FINGERTIPS

Throughout the country, Airco oxygen plants, with their storage facilities and their fleet of delivery trucks, provide a dependable and flexible supply, not only for your routine oxygen needs but for your peak and emergency requirements as well.

Your everyday needs, of course, are supplied from the oxygen plant nearest you, promptly and with a minimum of scheduling and transportation. But, if this plant should shut down for a few days or temporarily curtail its output (all oxygen plants must do so occasionally, for maintenance or other reasons), you'll probably never even know it. There's another Airco plant ready to back up the one that usually supplies you.

Perhaps you use oxygen and other industrial gases right in your shop. On the other hand, maybe your work is on location, like the company that scrapped the ship shown on the reverse side of this page. No matter where you work, you can count on Airco to supply the gases you need . . . in the quantities you need . . . whenever you need them.

Airco specialists can help you *use* these gases most efficiently. Let your nearest Airco office help plan the most economical supply for your needs.

"WHATEVER WE DO" — New documentary, color — sound movie tells the fascinating story of atmospheric gases in industry and in your daily life. Arrange for a free showing through your nearest Airco office.

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AND DEALERS IN
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Represented Internationally by Airco Company International
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At the frontiers of progress you'll find

AN AIR REDUCTION PRODUCT

Welding Info-Aids . . .

1 WELDING WIRE — Weldwire Co., Inc. 6-page pamphlet WS 8/1/53 lists prices of "Weldspool" precision-spooled welding wire for all inert-gas shielded processes. Includes data on stainless, bronze, high-nickel alloy and aluminum wires.

2 WELDING REPORT — Eutectic Welding Alloys Corp. 16-page brochure describes this firm's history, products, manufacturing equipment and procedures as well as its research projects and discoveries. Explains how non-fusion welding differs from conventional processes.

3 HARDFACING ALLOYS — American Manganese Steel Division, American Brake Shoe Co. "Amsco" hardfacing rods and electrodes are described in this 46-page Catalog 9-53. Illustrated in color, the catalog lists specifications and typical applications of the alloys. 4-page insert lists latest prices.

4 WELDORS' GARMENTS — Eastern Equipment Co., Inc. "Amcoweld" leather and asbestos garments for protection of weldors are described in 4-page illustrated folder (Catalog Section AWP-40). Shown are capes, coats, jackets, pants, chaps, sleeves, bibs, gloves, mitts, etc.

5 ALLOYS, FLUXES — All-State Welding Alloys Co., Inc. 24-page pocket-size booklet is buyer's guide to complete line of firm's alloys and fluxes for welding, brazing, soldering, cutting and tinning. New edition has more complete and up-to-date data, which is set in larger type.

6 HARDFACING — The Lincoln Electric Co. Bulletin 466 is 24-page illustrated "Weldirectory" for hardfacing. Listed are typical applications of the various electrodes. Data on page 18 on agglomerated fluxes are presented for the first time.

7 TOGGLE CLAMPS — Erico Products, Inc. Catalog TC-7 gives information on complete line of "Caddy" toggle clamps. One of the newest is the "P-2", a horizontal-type clamp with pressure capacity up to 3,000 lb.

8 COVER GOGGLES — American Industrial Safety Equipment Co. New literature concerns "EyeGard Imperial" cover goggles, which are specifically designed to fit over large-frame prescription glasses. Ventilation has been improved and area of vision increased.

9 MAINTENANCE KIT — National Cylinder Gas Co. 8-page Form N-117 is three-color illustrated catalog describing "Sod-R-Braze" air-acetylene apparatus. Kit, consisting of torch, tips, hoses and regulator, permits quick maintenance and repair work on jobs where fusion welding is not necessary.

10 ELECTRODE HOLDERS — Cam-Lok Division, Empire Products, Inc. 2-page Bulletin 111 describes two new "coolie" welding electrode holders, which have inside mechanism suspended in the handle for better ventilation and cool operation. Includes photographs, prices and specifications.

11 CLAMPING JIGS — Adjustable Clamp Co. 2-page supplement No. 1 to Catalog 18 tells of "Jorgensen" bar clamps, which have a hinged foot. Hinge action permits the clamps to be dropped out of the way but ready for instant use. The supplement includes specifications and a price list.

TO OBTAIN: manufacturer's catalog or bulletin described on this page, use the card sections printed below. Insert number of the item or items that interest you. THE WELDING ENGINEER will ask manufacturers to send the information requested.

Each card section must be completely filled out. Do not use ditto marks. These cards are not good after May 1, 1954.

How to obtain manufacturers' literature:

Fill out card section and write in number of item as shown at right:

Number → 23
Name John Smith
Company Rex Mfg. Co.
Address 3217 Lewis Ave.,
Chicago 16, Ill. Title Engineer
THE WELDING ENGINEER

Number →
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Company
Address
Title
FEB., 1954 THE WELDING ENGINEER

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Place 2c Stamp Here

THE WELDING ENGINEER
520 NORTH MICHIGAN AVE.
CHICAGO 11, ILL.

CARDS NOT GOOD AFTER MAY 1, 1954

12 STRANDED ELECTRODES — Air Reduction Sales Co. "Stranded Electrode Materials for Aircomatic Welding" is the title of a 12-page illustrated article, reprinted from *The Welding Journal*, that discusses the use of stranded wires in the inert-gas-shielded, metal-arc, consumable-electrode "Aircomatic" welding process.

13 WELDING DATA — Ampco Metal, Inc. "Welding with Ampco Bronze Electrodes, Filler Rod and Wire" is the title of 24-page Bulletin W-17. It describes the complete line of the firm's products that are used with the metal-arc, carbon-arc, tungsten-inert-gas, submerged-arc and inert-gas consumable-electrode processes.

14 HARDFACING RODS—Victor Equipment Co. Booklet (Form 335-10M-453 CW) describes and lists applications of "Victorite 1, 6 and 12" hardfacing alloys. Available rod sizes and recommended amperages are listed.

15 STEEL CHARACTERISTICS—The International Nickel Co., Inc. Bulletin A-157 is a 48-page bibliography on low temperature characteristics of steels. Listed chronologically are 468 U. S. and foreign magazine articles, translations, pamphlets and books on the subject. Included is an alphabetical index of authors.

16 WELDING NOZZLES — Tru-Ohm Products Division, Model Engineering and Mfg., Inc. Leaflet illustrates and describes ceramic welding nozzles used in inert-gas processes where manual operation is indicated. The nozzles are said to assure a gas flow that is more directional without any loss of volume and without increasing the arc-clamping characteristics.

17 GRINDING WHEELS — The Metal Removal Co. 8-page color Catalog 30 lists complete line of firm's porcelain and resinoid bonded mounted wheels.

18 FLUX — Solar Aircraft Co. 3-color folder describes the use of firm's "Type 202" flux for welding aluminum and its alloys. In using the new flux, the weldor has a clear view of the naked puddle, and no wiping is necessary. Use of "202" is said to eliminate need for pickling prior to welding.

19 TORCH-GUIDING MACHINE — Heath Engineering Co. 4-page illustrated booklet tells of "Ultra-Graph" oxyacetylene torch-guiding machine. Without changing set-up, the machine can cut metal up to 8 in. thick. The only operating control is a rheostat, which regulates travel speed, and the only operating adjustment is setting the distance of the torch tip from the material to be cut.

20 TUBE DATA—Amperex Electronic Corp. 26-page booklet includes detailed data, application notes, typical performance curves, special features and description of twin tetrode tube "Type 5894/AX-9903." New-equipment designers should find this brochure useful.

21 FUME EXHAUSTERS — Torit Mfg. Co. Ten exhausters, ranging in capacity from 350 cfm to 4,000 cfm, are described in a new folder. Made of heavy sheet metal supported on a steel base, the exhausters are said to remove fumes, odors, gasses, etc. from such industrial operations as welding, soldering and metallizing.

22 METALLURGY — Illinois Institute of Technology. "Extractive Metallurgy" is the title of a new folder published by Armour Research Foundation of IIT. The folder states the Foundation's goal in this field and lists its personnel and their areas of experience.

23 FIXTURE COMPONENTS — Jergens Tool Specialty Co. 2-color folder describes expanded line of jig and fixture components. The line includes more than 500 items.

24 WET BLASTER — American Wheelabrator & Equipment Corp. Bulletin 93 tells of new "Model 30 Liquamatte" wet-blasting machine. The illustrated brochure gives complete general specifications. The machine is designed for precision cleaning and finishing operations involving small parts that can be lifted and handled manually.

25 SILICON CARBIDE — The Carborundum Co. 52-page brochure discloses the properties of silicon carbide in relation to its many applications, one of which is its use as a deoxidizer in the metallurgy of iron and steel. Prepared by the firm's research and development division, the booklet includes an extensive bibliography.

26 X-RAY EQUIPMENT — Research & Controls Instruments Division, North American Phillips Co., Inc. "Research and Control Instruments—X-Ray and Analytical Equipment" is the title of a new 64-page reference book. It covers X-ray diffraction, spectrometry and spectrography as well as such components and accessories as tubes, rectifiers and cameras.

27 TESTING INSTRUMENTS — J. W. Dice Co. Illustrated 8-page Bulletin 32 describes non-destructive and physical testing and measuring instruments. One such instrument, microhm meter 151 for spot-weld quality control, checks cleanliness of aluminum or other sheet material prior to welding.

28 FIRE EXTINGUISHERS — Stop-Fire, Inc. Automatic fire protection is the subject of 2-page Bulletin SP-753, which describes the "Redi-Matic" automatic sprinkler-type fire extinguishers. Designed to permit easy installation over fire hazards, the units require no piping. Of 1-gal capacity, they contain vaporizing liquid fire extinguishers stored under pressure.

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THE WELDING ENGINEER

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Company.....

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FEB., 1954 THE WELDING ENGINEER

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THE WELDING ENGINEER, FEB., 1954

DEPT. OF DEFENSE work . . . by *LINDBERG* Induction Heating Units

L. A. Young Spring & Wire Corp., Detroit, Mich., use two 5 KW Lindberg Induction Heating Units for production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting requirements.

We can't tell you much about the manufacturing processes at the L. A. Young plant (due to security restrictions) . . . but we can tell you about the many rugged construction features of this equipment . . . features which make it so dependable that the L. A. Young organization selected Lindberg Induction Heating Units for their important Department of Defense work. These points of design and construction will minimize costly breakdowns and aggravating work stoppages:

Filament voltage regulation transformers keep tube filament voltages at proper values regardless of line fluctuations. The end result . . . longer tube life.

Checklites . . . A system of indicating lamps instantly reveals any abnormal operating conditions . . . simplifies servicing.

Work coil burn-out protection . . . An electrical interlock system makes it impossible to turn on power when cooling water is not flowing.

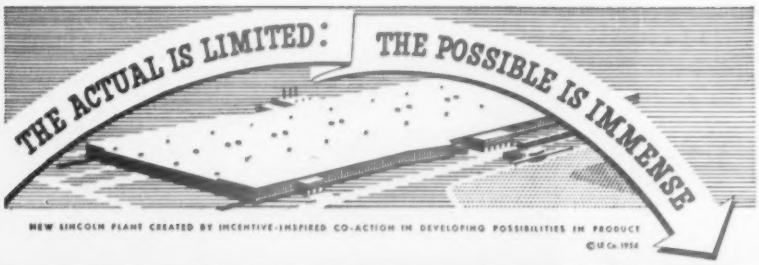
Long-life industrial tubes feature shortened internal structure . . . Kovar metal-to-glass Seals . . . heavy walled anodes.

Sealed tank capacitors are hermetically sealed against dirt and dust . . . require no servicing or refilling.

Investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.

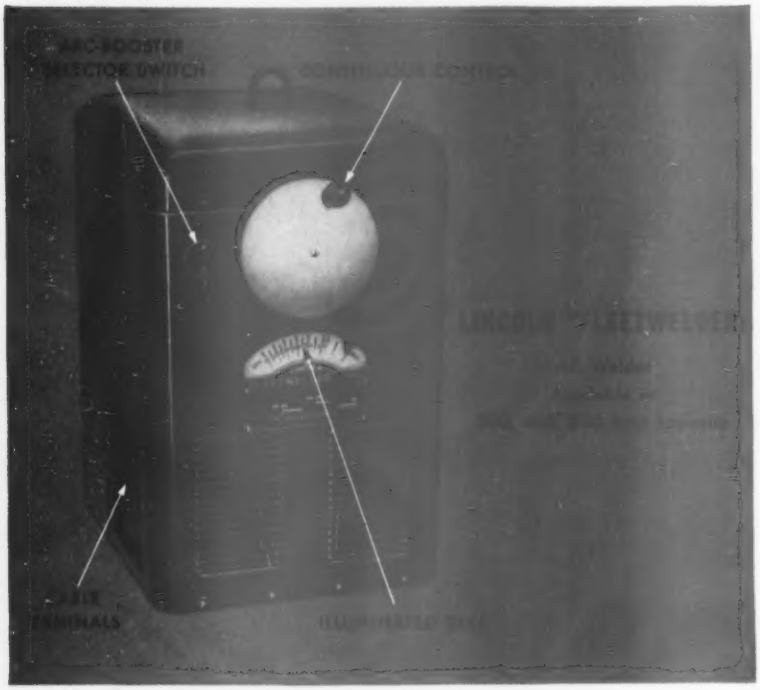
LINDBERG

HIGH FREQUENCY DIVISION
LINDBERG ENGINEERING COMPANY,
2442 West Hubbard Street, Chicago 12, Illinois



NEW LINCOLN PLANE CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

©LE Co. 1954



AC WELDING MADE SIMPLER

- **Easy Current Selection.** A few turns of "Fleetwelder's" dial-operated Continuous Control select any current from a wide welding range. The exact welding current is indicated on an illuminated dial that also shows whether the machine is turned on or off.

- **Current Stays Set.** Rugged holding devices maintain accurate current settings. There are no sliding mechanisms or moving coils to become loose as the arc is struck.

- **Safe to Operate.** "Fleetwelder's" open circuit voltage is held to 71 volts for safety. Where specified, open circuit voltage can be limited to 24 volts by an optional safety contactor.

- **Arc is Self-Starting.** There is no more electrode sticking to slow up welding operations as on conventional AC machines when lighter currents and smaller electrodes are used. "Fleetwelder's" Arc-Booster starts the arc instantly each time the electrode touches the work.

- **Quality Comes Easier.** Lincoln's hot-start arc prevents cold overlaps . . . insures instant penetration at the start of every weld, an advantage for tack or plug welding.

ONLY FLEETWELDER'S HIGHER USEABLE CURRENT REALLY CUTS AC WELDING COSTS

It's so . . . By taking advantage of Lincoln's higher useable currents, you can now weld faster . . . use larger diameter electrodes to cut AC welding costs 10% and more. That is why the "Fleetwelder" starts saving money on your very first job . . . and for these reasons:

1. Higher Useable Current There are more *reserve* amps . . . up to 50% added current . . . in the "Fleetwelder" to put to work on your welding jobs. As a result, you get more amps per dollar with Lincoln than with any other welder.

2. Complete Overload Protection It is safe to operate at "Fleetwelder's" additional current because of built-in thermostats that cut out the magnetic starter . . . eliminating all danger of burn-out . . . *a feature found only in Lincoln.*

"Fleetwelder" Pays for Itself. Labor and overhead savings through "Fleetwelder's" faster operation return your investment in surprisingly short period. Have your Lincoln representative show you how. Write

SEND FOR BULLETIN

Complete description and specifications on "Fleetwelder" are in Bulletin 1314, available by writing on your letterhead.

THE LINCOLN ELECTRIC COMPANY

Dept. 1701

CLEVELAND 17, OHIO

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ESTABLISHED 1916

THE WELDING ENGINEER

FEBRUARY, 1954

Are You Wishing or Working?

IF YOU WANT something badly enough, you can have it. The catch is that you must be willing to work hard enough to get it. And you mustn't want too many things at the same time. It's a full time job to make just one of your dreams come true.

There are a few exceptions to the general rule that if you want something badly enough to work for it you can have it. Some people want things entirely beyond their capabilities. No matter how hard they may be working, they will always fall short of their goals. The only remedy is for them to revaluate themselves and set more modest goals.

Another exception is the man who thinks he is working hard for "success" but does not know just what it is that he really wants. The world is full of confused people like that.

Another apparent exception to the general rule is the lucky fellow. Some people do seem to get things without working or without any effort whatsoever on their part. Let's ignore them. They are very few, anyway, and their luck may not always be as good as it seems.

If you want a portrait of an average man, it will run about like this: He knows—or thinks he knows—what he wants out of life but is doing very little towards getting it. Mostly he is just content to let things drift from day to day. If expenditures of human energy could be plotted against the capabilities of these "average" men, the resulting curve would show few of them more than 10% efficient.

SOME MEN are a continual source of amazement to their friends and acquaintances because they accomplish so much. They shine out like first-magnitude stars in the sky. Are they supermen? Not in the least; they are everyday human beings like you and me.

If you could examine the life record of one of those men, you would be astounded at the simplicity of his success. He merely sets his eyes on a reasonable goal and works toward it every minute of the working day. You can do the same. However, you'll have to replace your wishbone with a backbone. Most of us simply won't make the effort.

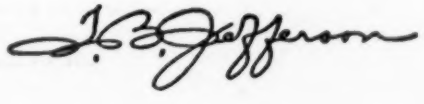
Discouragement is a factor that stops many of us in our tracks. We try—and try hard, we think—but we don't seem to be getting anywhere, so we give up. We tell ourselves that the "game isn't worth the candle," that "the grapes are sour," that "nobody can beat the system" and a host of other comforting things and then fall back to sleep again. The men who get places can't afford the luxury of becoming discouraged.

IT IS HARD to find a welding distributor who would not like to have more business. He won't get it, however, by sitting around and waiting for the telephone to ring. The telephone doesn't ring under those circumstances. It always rings at times when you least expect it.

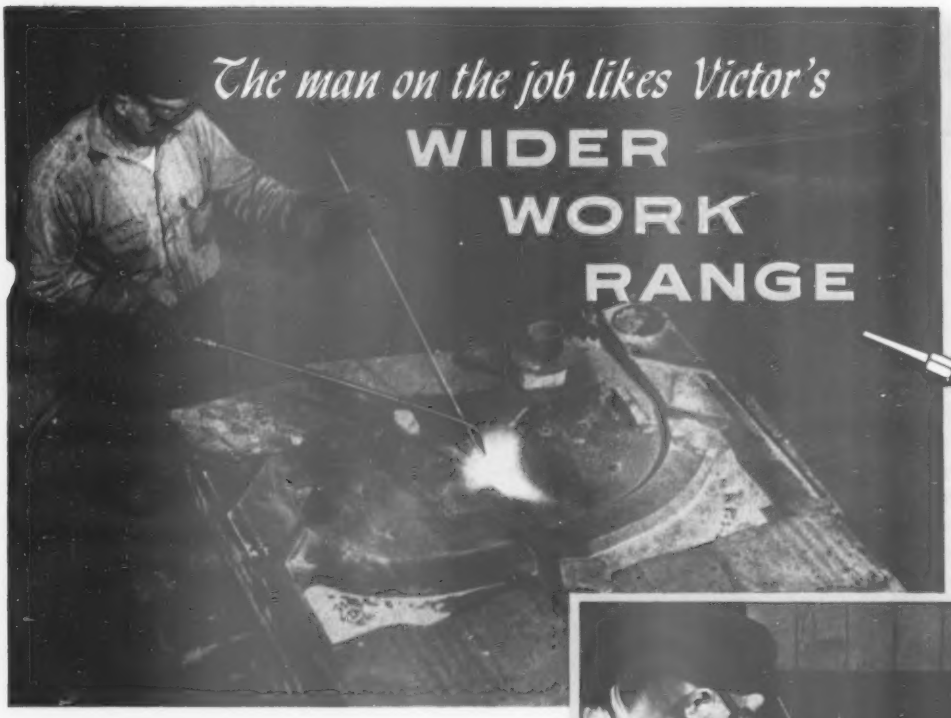
The bigger the distributor is, the harder it is for him to get more business. The small distributor has it easy—he can put on just one aggressive campaign and maybe double his sales volume. It doesn't work out that way for the larger distributor. He runs smack up against what economists call the "law of diminishing returns." After the volume has increased to a highly respectable figure, the development of addititonal increases percentagewise becomes very difficult. Often it seems impossible, so our distributor suspends further effort. That is when his business starts to go downhill. And competitors lick their chops in gleeful anticipation of a feast to come.

Another distributor may be working hard but is going nowhere. He's like an automobile stuck in a snowdrift—the motor is running, the wheels are spinning, a lot of energy is being expended but the car is not moving ahead. Press down the accelerator to the floorboard; it won't do a bit of good until you shovel away the snow and put something under the wheels so they will get traction.

People spin their wheels, too, and wonder why they are not going places. What they need to do is to make an intelligent appraisal of the situation and then direct effort along the lines where it will pay dividends. In other words, to shovel away the snow so the car can move ahead.



The man on the job likes Victor's
WIDER WORK RANGE



Using a VICTOR No. 310 torch butt with two S2 extensions and No. 8 type 4 tip, Joe Wyman (Shreve Welding Co., Oakland, Calif.) repairs cast iron heating boiler header with VICTOR No. 1 low fuming manganese bronze rod. Inset photo shows 5/64" build-up on undersize castings, done with same No. 310 torch but with No. 5 type 4 nozzle and VICTOR No. 6 square cast iron rod.

VICTOR'S wider work range pays off from the day you select your first VICTOR welding outfit on through a lifetime of reliable service. You buy the torch you need for your present work, add extensions, cutting attachments or special nozzles as they're needed. Result: top-quality equipment that's always perfectly matched to your needs!

Whatever the job . . . welding, cutting, heating, brazing, descaling . . . you'll start it quicker, finish it sooner with versatile VICTOR equipment!

VICTOR for welding

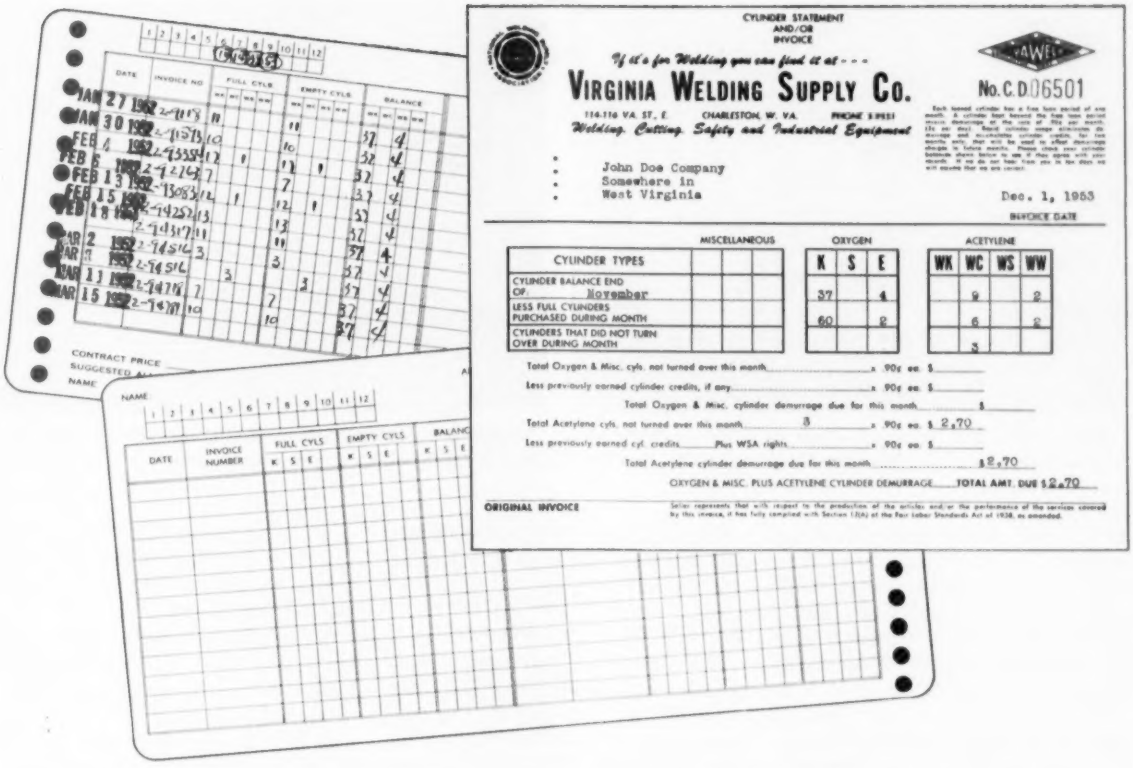
LOOK FOR THE VICTOR DEALER SIGN . . . *ask him to show you why it costs less to own and operate VICTOR.*

VICTOR EQUIPMENT COMPANY

10

Mfrs. of welding & cutting equipment; hardfacing rods; blasting nozzles.

3821 Santa Fe Ave. LOS ANGELES 58 — **844 Folsom Street SAN FRANCISCO 7**


CYLINDER STATEMENT AND/OR INVOICE
If it's for Welding you can find it at - - -
VIRGINIA WELDING SUPPLY CO.
114-116 VA. ST., E. CHARLESTON, W. VA. PHONE 3-9151
Welding, Cutting, Safety and Industrial Equipment
No. C.D 06501
John Doe Company
Somewhere in
West Virginia
Dec. 1, 1953
INVOICE DATE
CYLINDER TYPES
MISCELLANEOUS
OXYGEN
K S E
ACETYLENE
WK WC WS WW
CYLINDER BALANCE END OF: November
37 4
9 2
LESS FULL CYLINDERS PURCHASED DURING MONTH
60 8
6 8
CYLINDERS THAT DID NOT TURN OVER DURING MONTH
3
Total Oxygen & Misc. cyls. not turned over this month x 90¢ ea. $
Less previously earned cylinder credits, if any x 90¢ ea. $
Total Oxygen & Misc. cylinder demurrage due for this month $
Total Acetylene cyls. not turned over this month 3 x 90¢ ea. $ 2.70
Less previously earned cyl. credits Plus WSA rights x 90¢ ea. $
Total Acetylene cylinder demurrage due for this month $2.70
OXYGEN & MISC. PLUS ACETYLENE CYLINDER DEMURRAGE TOTAL AMT. DUE $2.70
ORIGINAL INVOICE
DATE
INVOICE NUMBER
FULL CYLS
EMPTY CYLS
BALANCE
NAME

Business Forms Build Business

WILLIAM A. RICE, of Charleston West Va., believes that a business concern cannot be operated on a hit-or-miss basis if it is to be consistently successful. It must be managed, he says, with the same careful attention to detail that is followed by an architect in planning a building.

How do you accomplish that kind of careful control in the welding supply business? Some helpful hints will be found in the management practices of Rice's Virginia Welding Supply Co. An excellent example of how good management can simplify business problems is provided by the system Rice has worked out for handling demurrage charges on oxygen and acetylene cylinders.

CYLINDER CONTROL METHOD

Customer resentment over demurrage charges is always a stumbling block in the way of good relations. Rice operates on the basic theory that cylinder control is a part of sales—not accounting—because a customer incurring demurrage becomes highly vulnerable to the sales talks of competitors. So important is this problem deemed that one department head does nothing but make analyses of cylinder control and cylinder turnover.

SIMPLIFIED cylinder record system used by Virginia Welding Supply Co. Reproduced at top of this page are the two forms that do most of the work. On the left is shown portions of the cards on which records are kept of the full cylinders delivered to the customer and the empty cylinders that he returns. The balance at the end of the month represents the number of cylinders on which demurrage charges are made.

Note that the company is not concerned with the serial numbers of cylinders nor the dates on which any particular cylinder went out and was received back.

On the right is the cylinder statement and/or invoice that is sent to customers on the first of the month to show the cylinder balance and the demurrage charges. This cylinder statement goes out to every gas customer, regardless of whether or not he incurred any demurrage that month, so he may verify his cylinder balances every month.

Here are the details of Rice's cylinder control method as explained in his own words:

"Our control differs from others in that we have eliminated demurrage days and the 30-day free loan period. We give a customer a one-month free loan period for each cylinder. We assume that there are twelve 30-day months in a year and simply say that 30 days times 3c per day is 90c demurrage per cylinder per month for all cylinders in the customer's possession that were not turned over during the previous month. To be specific, a customer has ten cylinders at the end of the month and purchased five during the same month; he owes us five times 90c or $4.50 for the cylinders not turned back. We are not concerned with the day that a cylinder went out, is due back or actually came back. We do not care about the cylinder numbers.

"We use a special cylinder control

BILL RICE (at left), president of Virginia Welding Supply Co., talks it over with Treasurer H. B. Coulter

TEAM of Tackett, Goodwin and Summerfield makes all the records while a customer's cylinders are loaded

card, color coded to indicate the type of gas. This card (reproduced herewith) is based on the simple debit-credit, running balance accounting system. Our cylinder statement and/or demurrage invoice (also reproduced) is a special snap-out form with automatic follow-up features that can be readily understood by the customer. It is sent to him each month, regardless of whether or not be incurred demurrage during the month. The reason for this is so that he may verify his cylinder balances each month.

"Whereas it used to take four days for us to check a customer's cylinder account, it can now be done in ten minutes by one girl. She simply removes the customer's cylinder control record from the master book and puts it through our photocopy machine. The photocopy transcript is sent to the customer for his verification.

"Results? We are doing approximately 30%, or better, greater gas volume this year in the same number of cylinders we used last year. Our ratio of payment of demurrage to our supplier to the demurrage billed by us is extremely healthy.

"Cylinder control, as we use it, is original with us. We are gladly offering the method to whoever wishes to use it, however, and are pleased to have it explained in the pages of your publication."

Thanks a lot, Bill Rice, for this splendid analysis. There isn't much we can add to that by way of comment except to say that the immediate results of this program have been increased revenue, more time for sales and better customer understanding and relationship on cylinder control and demurrage.

No Slave to His Business

Rice feels that to spend every minute of your waking time either working or in worrying over your business is no way to live. As the head of the business, he avoids being enslaved by it by delegating authority. At Virginia Welding, management is every employee's responsibility.

In many businesses, delegated authority bogs down or goes sour because it is not complete. At Vaweld, each employee is, in effect, a department head and has absolute control over his or her department. Only in the case of emergencies and changes of policy is it necessary to go higher up for clarification.

It should be stated that each employee at Vaweld is made thoroughly acquainted with the duties he has to perform at the time when he first starts to work. Furthermore, no employee has duties that lap over on someone else's job. As Rice puts it, "We are a family of specialists."

Here is a specific example of the smoothly running machinery:

A customer backs his truck up to the loading platform and comes in the store to exchange cylinders. The shipping clerk informs Miss Janet Tackett over the intercom system. She writes up the invoice and hands it to Mrs. Nellie Goodwin, who checks it for cylinder control. Mrs. Goodwin passes the invoice on to Mrs. Mary Summerfield, who checks it for credit clearance. Mrs. Summerfield passes it to Mrs. McCune for final checking and pricing. Each one initials the invoice with a differently colored pencil.

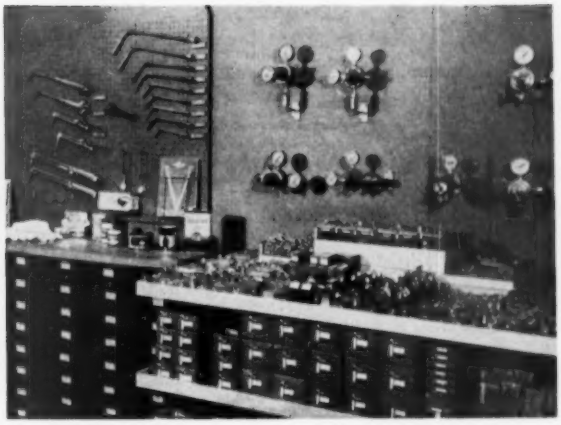
While the customer is waiting in the display room for his truck to be loaded, he has plenty of opportunity to see other supplies and equipment, with the result that he usually decides to buy something else. He picks up the small articles right from the display table or wall board and hands them to the counter man, Harry Agee, saying, "Put these on my bill."

The counter man does not have to make out an additional invoice. He merely tells Miss Tackett over the intercom, and she adds these purchases to the previously written invoice. This speed-up method of waiting on customers has gained a great deal of good will for Vaweld.

The counter salesman does not have to handle cash, make out delivery slips or handle cylinders. His job is to answer phone calls, wait on "drop-in" customers and keep the salesroom well stocked. This last task really *is* a chore; you'd be surprised how fast such items as tools, gloves, specialty rods, etc. are taken off the wall display boards and tables. Though visitors can't be watched all the time while they are in the store, such surveillance has fortunately not proved necessary. Pilferage has been nil, Mr. Rice reports.

The Organization

Virginia Welding Supply Co., or Vaweld as it is usually known, has 17 full-time employees: four girls in the office, three rural route salesmen, two city route salesmen, two outside



WHILE customer waits for his cylinders, he looks at displays like these. It is a rare customer who does not select one or more of these products. Charge is added to his invoice for the welding gases by the office staff

creative salesmen, one inside counter man, two truck drivers, a shipping and receiving clerk and two repair men. One of the repair men is used as pinch hitter when a route salesman is ill or otherwise prevented from working.

Here is what Rice has to say about the duties of these various people:

"Our creative salesmen promote the use of welding or gases for medical use, etc. Their end results are sales, but they do not promote sales as such. We have no truck drivers other than the drivers of the two feeder trucks that are used to haul our gases from the manufacturer's plant and our welding electrodes and welders from another manufacturer. The drivers of our other trucks are route salesmen, who are placed on salary and commission with expense accounts. These men are well trained and versed in welding sales. They are sent to our suppliers' plants for instruction periodically."

Territory and Trucks

Virginia Welding Supply is centrally located in Charleston, a city of 85,000, which lies in the "Magic Kanawha" Valley. It should be made clear, perhaps, that this is the West Virginia and not the South Carolina Charleston. The territory is a land of industrial giants, including the largest electrometallurgical, axe and sheet glass plants in the world. A variety of products ranging from nylon, orlon, dynel, permanent antifreeze and asperin tablets to fine hand-blown glass is manufactured.

Vaweld route coverage is good. Customers can depend upon the route salesmen to have practically anything needed right with him. Ample stocks are packed in boxes carried on the sides of the truck.

A few words about the type of truck might be in order. Once again, we'll let Rice do the talking:

"Our route trucks are the result of years of constant experiment. They are 29 in. from bed to ground and have special cable ratchet binders to hold the cylinders. We carry approximately $2,000 worth of supplies (other than gases) in special boxes built into the beds forward of the rear fenders. These boxes have special rod racks and also metal cabinets for the storage of small items.

"We own all of our trucks and cars. We never lease. They are traded in at 40,000 miles or two years, whichever comes first. Purchase of a new truck is decided by an informal committee of three: the salesman who is to use the unit, our treasurer and myself. We act together to make the final decision as to the type of truck to be purchased and the exact time of purchase."

All trucks have a new type of cylinder binder that saves many hours over the clumsy chain binder that was formerly used. The binder is of the wire rope ratchet type and will hold any load intact. Once a truck turned completely over, but the cylinders it carried were not dislodged.

Rice is a great believer in the open display system. Everything in his showroom is displayed in a manner similar to the well known practices of the big (and successful) chain stores. Customers are able to pick up anything they please, but, as we have before stated, the standard-level of honesty in Charleston is very high.

Sales are promoted indirectly by means of welding clinics, usually held twice a year. Rice comments on them as follows:

"We try to have only supervisory personnel present at these clinics. We have held three special evening clinics on metal inert-gas and tungsten inert-gas welding even though we do not stock or sell material for either of these processes. We sponsor such demonstrations because we wish our customers to see the new developments in our industry at Vaweld and not at a competitive place of business. Welding clinics are expensive but have been very fruitful to us in increased business."

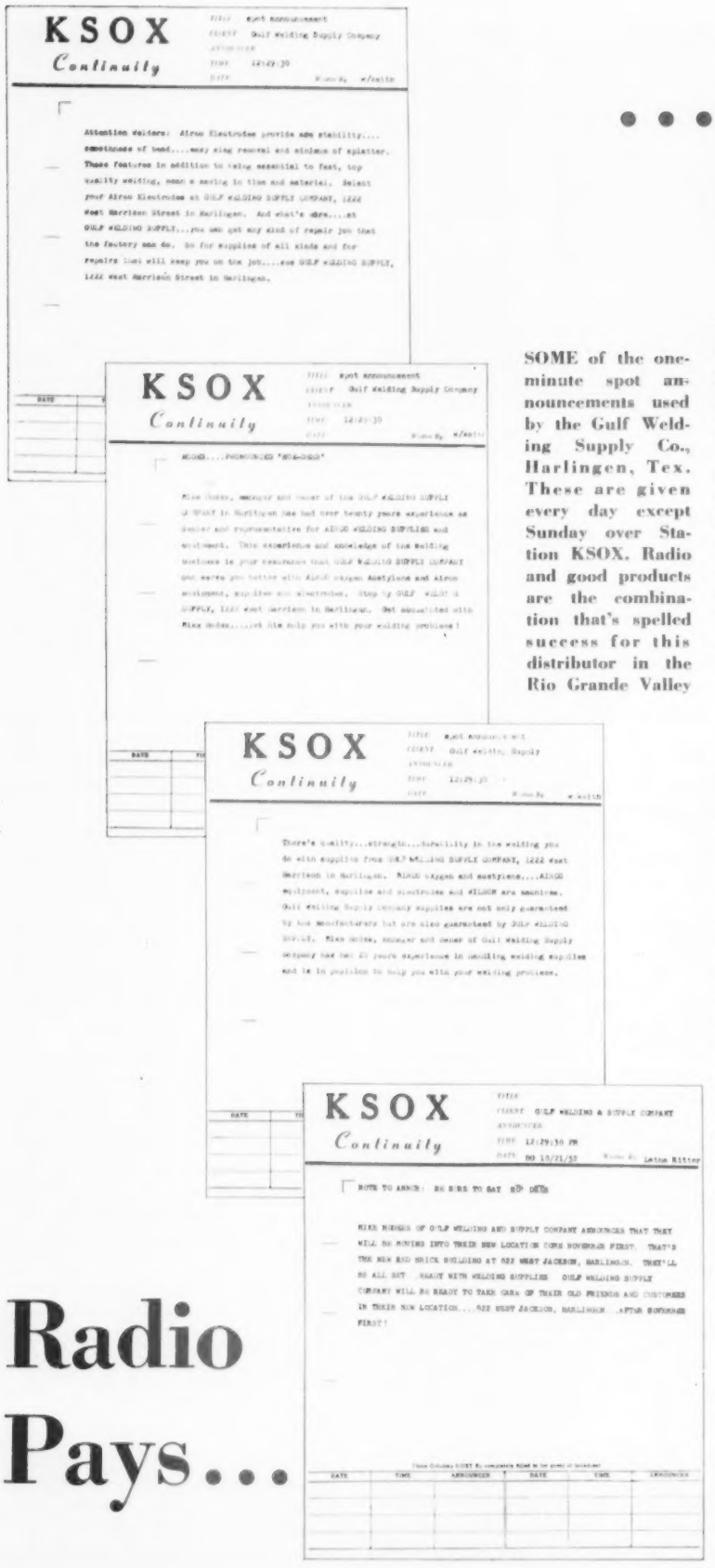
Sales Aids

One of the company's best salesmen is its catalog, which is laid out to conform to the layout of the stock in the display room. Items on the left side of the store are in the front pages, next comes the items on the right, etc. The catalog is written, edited and entirely laid out by the Vaweld staff. Many distributors have tried to copy it, proving once again that imitation is the sincerest form of flattery. Many manufacturers (including those not represented) have written to compliment Rice.

The catalog is supplemented by direct mail. Every customer on the Vaweld list gets at least two pieces of literature a month. Also used are "giveaways" such as matches, pen-

(Continued on page 46)

Radio Pays... ...for Gulf Welding


KSOX
Continuity
Attention Welders: Airco Electrodes provide arc stability.... smoothness of bead....easy slag removal and minimum of splatter. These features in addition to being essential to fast, top quality welding, mean a saving in time and material. Select your Airco Electrodes at GULF WELDING SUPPLY COMPANY, 1222 East Harrison Street in Harlingen. And that's more....at GULF WELDING SUPPLY....you can get any kind of repair job that the factory can do. Go for supplies of all kinds and for repairs that will keep you on the job....see GULF WELDING SUPPLY, 1222 East Harrison Street in Harlingen.
KSOX
Continuity
SOUND....PRONOUNCED "KSO-SOX"
KSOX
Continuity
There's quality...strength...durability in the welding you do with supplies from GULF WELDING SUPPLY COMPANY, 1222 East Harrison in Harlingen. Airco oxygen and acetylene....Airco equipment, supplies and electrodes and Wilson are machines. Gulf welding Supply Company supplies are not only guaranteed by the manufacturers but are also guaranteed by GULF WELDING SUPPLY. Mike Hodes, manager and owner of Gulf Welding Supply company has had 15 years experience in handling welding supplies and is in position to help you with your welding problems.
KSOX
Continuity
GULF WELDING & SUPPLY COMPANY
12:29:30 PM
NO 10/21/53
NOTE TO ANNCR: BE SURE TO SAY NEW DATE
MIKE HODGES OF GULF WELDING AND SUPPLY COMPANY ANNOUNCES THAT THEY WILL BE MOVING INTO THEIR NEW LOCATION CORN NOVEMBER FIRST. THAT'S THE NEW AND BRICK BUILDING AT 522 WEST JACKSON, HARLINGEN. THAT'LL BE ALL SET....READY WITH WELDING SUPPLIES. GULF WELDING SUPPLY COMPANY WILL BE READY TO TAKE CARE OF THEIR OLD FRIENDS AND CUSTOMERS IN THEIR NEW LOCATION....522 WEST JACKSON, HARLINGEN....AFTER NOVEMBER FIRST!

SOME of the one-minute spot announcements used by the Gulf Welding Supply Co., Harlingen, Tex. These are given every day except Sunday over Station KSOX. Radio and good products are the combination that's spelled success for this distributor in the Rio Grande Valley

RADIO advertising has been used by most welding distributors with indifferent success. The experts will tell you the principle is all wrong. Radio is a mass medium and as such is too costly for a specialized sales agency like a welding distributor to use. Maybe so. But down in Harlingen, Texas, Mike Hodes and his wife Maybell have really made it pay off. Mike gives a great deal of the credit for the success of the Gulf Welding Supply Co. to the daily spot announcements they send out over the air waves.

Nature Made It Tough

Mr. and Mrs. Hodes organized the company as a partnership in September, 1948. Mike had had 15 years of previous welding experience, but none of it in the Rio Grande Valley. So they had to start from scratch. During the five years the Hodes have been in business, this predominantly agricultural area has suffered under (1) a freeze that destroyed the main crop—citrus fruit—and (2) the worst drought on record, which has lasted for the past two years. Also the valley has experienced one of the worst price wars in oxygen history.

Despite all the above handicaps, Gulf Welding Supply Co. has grown. Its business has been so good, in fact, that a second store was opened at Edinburg, 30 miles to the west, while the Harlingen operation has been moved into new and larger quarters fronting on Jackson Street, the town's main business street.

With this bit of background information under the belt, we can return to the subject of radio announcements. The spot announcements used by Gulf Welding Supply are of one-minute duration and are given every day except Sunday from 12:29 to 12:30 p.m. A different announcement is prepared for every broadcast. While six minutes of radio time per week does not sound world shaking,

the noon-hour broadcast has been able to contact a lot of farmers, Mike's principal prospects.

According to a survey made by KSOX, the local radio station, about 20% of the farmers in the area are tuned in during the noon hour. For an expenditure of around $80 per month, Gulf Welding Supply is able to talk to more farmers than a full-time salesman could. It is true that the salesman would be able to talk more than a minute to each prospect, but on the other hand his salary would amount to five or six times the cost of the radio program.

Don't get the idea, however, that Gulf Welding is able to do without salesmen—or attempts to do so. Salesmen are kept busy calling on industrial plants, job shops, garages and other such users of welding supplies and equipment. Their jobs are not competitive with the radio advertising, which gets in its best licks in the rural territory.

How to Write a Script

Script for a one-minute radio broadcast can't be too long—about 100 words. To do a good job, these words must be effective. Each script is written with the idea of selling a single idea or product. To make sure that the name of the advertiser will be impresed upon the radio audience, Gulf Welding Supply Co. is mentioned at least twice in each broadcast. This rule is followed even when the company donates its time to such charitable activities as the Lions Club Minstrel.

The following examples show the sort of thing you can do when you have only one minute's time and 100 words at your disposal.

A community-spirited script reads:

"The Gulf Welding Supply, of Harlingen, urges everyone to attend the minstrel show sponsored by the two Lions Clubs of Harlingen again tonight and tomorrow night. For the benefit of the Lions Club Sight Conservation Fund 'Bell's A Hoppin' '—the Valley's best minstrel revue includes black-faced comedians—dancing girls . . . laughs and entertainment of all kinds. Just $1 donation for adults and 50c for children will admit you to the City Auditorium in Harlingen to see this show. The Gulf Welding Supply of Harlingen urges you to attend . . . have a full evening of entertainment and help out in this worthy cause."

Note the two mentions of Gulf Welding Supply.

Farmers are appealed to in this manner:

"Farmers . . . do you have a bolt to cut off or some little something to weld? If so, why not buy an inexpensive welding outfit at the Gulf Welding Supply Co.? Take your big or particular jobs to the welding and blacksmith shops, but you can save time and money by having your own welding torch and equipment for your little jobs. The Gulf Welding Supply Co., 822 W. Jackson Street, in Harlingen, can supply you with these welding outfits."

Job shops were alerted when this script read:

"The Gulf Welding Supply Co., Harlingen, takes pride in its complete stock of supplies, its fine equipment and dependable workmanship. If your problem is brazing aluminum to copper or aluminum to steel, Gulf Welding can supply you with the special rods and flux for this type of welding—can show you the special technique for using them. Whether your job is for oil field equipment or for a plowshare. Gulf Welding Supply, 822 West Jackson, Harlingen, is the place to take it. It's Gulf Welding Supply, Harlingen, for hardfacing alloys . . . always."

Sometimes the announcement will cover much of the line:

"The Gulf Welding Supply Co., Harlingen, is headquarters for hardfacing alloys. Besides being able to supply you with welding gases, equipment and supplies of all kinds, we can furnish you with grindstones, grinding discs and cut-off discs. These discs are made of woven and spun nylon impregnated with special abrasives, which practically eliminates breakage and gives long life. Whether your welding job is large or small—whether your welding job calls for supplies or knowledge—visit the Gulf Welding Supply Co., 822 W. Jackson, Harlingen."

Information, Please

Direct evidence that customers listen to these radio announcements has been furnished by the queries put to salesmen. When a broadcast has referred to brazing of aluminum to copper, to the arc welding of cast iron or to another "difficult" welding job, each salesman will be approached by several customers wanting further information. So the salesmen have to keep up with what's being said on the radio. They have to know the products that are being advertised and how they are used.

Indirectly, then, these spot announcements make for better salesmen.

Photo of the new Harlingen store at 822 West Jackson St., is reproduced at the top of this page. The store itself is a 30 by 60 ft brick and hollow-tile structure and is set 30 ft from the corner. The area between the store and the corner is fenced to provide parking space for customers and truck storage. Behind the building, an 8 by 40 ft cylinder dock gives ample loading area for the four route trucks and one utility truck. The company owns the vacant 50-ft lot on the other side of the store and is reserving it for future expansion. An enlargement project may have to be undertaken in the not-too-distant future if the business continues to grow.

The company now has over 800 accounts on its books and is doing a business amounting to nearly $250,000 a year. A part of its volume may be attributed to the radio advertising, but only a part. The major portion is due to the hard-working sales personnel (including the two partners) and to first-class lines of merchandise. Manufacturers' representatives have also furnished valuable assistance.

Mr. Hodes is now looking forward to spot announcements on TV.

SUPERSALESMAN Jimmy Turner (left of left picture) and one of his customers, A. J. Kelly, of the Industrial Piping and Supply Co., Charlotte, N. C. Right picture: a part of the office where Jimmy *doesn't* hang his hat

Man at Work

He started out with a consigned stock. In 14 years he's built up a sales volume in the $1,000,000 a year class. You guess the name of this distributor.

IF YOU ever happen to be in Charlotte, North Carolina, stroll over to State and Gesco streets and call upon James A. Turner, Jr. If you have the good fortune to catch him in, you will enjoy yourself. Jimmy (as everybody knows him) is one of those rare individuals who have the happy faculty of making others feel good when they are with him. Maybe it's because he's a southern gentleman of the old school. Or maybe it's just Jimmy period.

But you probably won't find him in because he's much too busy outside to spend his time in the office.

What Jimmy has done with his National Welders Supply Co., Inc, is a saga of modern business.

Back in 1939, he was district manager of the Marquette Mfg. Co. for a seacoast territory that ran from Baltimore to Miami. Marquette had just brought out a line of a-c welders. Jimmy did well with those machines, but he felt that what he really wanted was to own his own business. In 1940 he decided to make the try.

His money was limited (how often have we heard that statement in connection with a would-be welding distributor) so in order to get started he asked several manufacturers to consign a stock of their supplies to him. He succeeded in convincing several of them (personality again) into putting up nearly $20,000 worth of merchandise. He rented a bonded warehouse in Charlotte to store this stock and started in selling.

Within two years, Turner had cleaned up the last of the consigned stock and was in business on a regular basis. He opened an office at 1230 South Tryon Street and hired his first salesman, L. B. Mann. And Mrs. Turner had been drafted into managing the inside office activities.

War clouds were looming over Europe and Asia, and our government had launched several programs to help protect ourselves against the coming storm. One of these was the financing of welding schools, which operated 24 hours a day for about two years and eventualy taught thousands of students in all phases of welding. Jimmy jumped into this program with both feet. He even helped plan piped oxygen layouts for some of the schools.

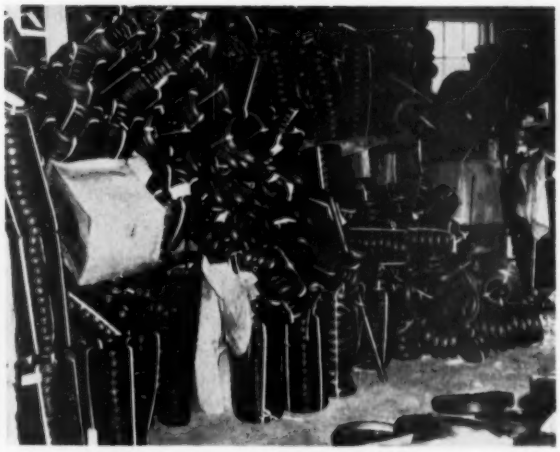
Cylinders are always a big problem to the welding distributor. National didn't own any cylinders at first, and complications set in. Cylinders were scarce in the war years, and Jimmy couldn't be too sure of his source of supply. In order to protect himself, he began to buy new cylinders and have them filled by a plant at Kingsport, Tenn. This arrangement was better but still not what he wanted. By late 1942, he could see his way clear to building his own acetylene plant.

Here is a peculiar quirk. It was at Spray, North Carolina, in 1892, that Thomas L. Willson, experimenting in search of a way to make metallic calcium, accidentally hit upon the way to make calcium carbide. Though North Carolina was thus the home state of acetylene, so to speak, acetylene had never before been manufactured there.

The first acetylene plant in North Carolina was built and ready to operate early in 1943. In 1945 National Welders Supply supplemented its facilities with an oxygen plant. By 1951 a second oxygen plant had to be built, and in 1952 a second acetylene plant was necessary. Today all four of these plants are running at capacity 24 hours a day and seven days a week.

To supplement its cylinder supply, National purchased as many surplus cylinders as possible from the War

NEW office and plant is only a step forward. Company is not content and is looking for a 15-acre site



RUBBER tires for cylinder trucks: one of the storage problems that confront National Welders Supply

PARTS storage is bursting the seams of the present quarters at State and Gesco streets, Charlotte, N. C.

DESPITE crowded condition, stock of welding rods and electrodes is stored in a neat, orderly fashion

Assets Administration in 1945. Over 20,000 of them were bought from surplus stocks. Today they are all gone, and National is using only new equipment.

Like most distributors, Turner originally sold direct to users. As his business grew, however, a program of selling to other distributors was inaugurated. The first major distributor was a former employee, Ed McKnight, of Winston-Salem, N. C. Under the name of "Edmac," this company now operates three trucks from its Winston-Salem headquarters.

Today a large part of National's business is done through resellers. The company has 500 distributors, who cover territories as far apart as Syracuse, N.Y., and Miami, Fla. Some 50 of these distributors (including those for medical gases) are within a 200-mile radius of Charlotte. Westward, the expansion has continued as far as western Texas.

Cylinders—Small and Big

National was one of the first companies to grasp the potentialities of the market for small cylinders. Thousands of such sets, holding under 100 cu ft of oxygen and 60 cu ft of acetylene and smaller, have been sold to farmers, small job shops and hobbyists with basement work shops. Today National has over 50 distributors handling this type of cylinder under a service rights agreement. Many of them are sold and serviced as far away as Ohio.

To supplement the small cylinders, Jimmy conceived the idea of a unit package that has been a huge success. It consists of a neat looking cylinder truck, a welding and cutting torch combination and pressure regulators. It is sold as a unit that includes the two cylinders.

National is now pushing another package deal of 12 oxygen cylinders (standard 300 cu ft capacity) banked together on a dolly. This package is for customers using piped oxygen. The units are sold, serviced and installed by National. Holding a total of 3,600 cu ft of oxygen, the 12 cylinders can be connected to a plant's oxygen piping system with only one on-and-off connection. The bulk unit is delivered by rolling it from the truck to the customer's platform with the aid of the built-in dolly.

Not content with this, National is working on an even larger package unit that will make use of big cylin-

ders containing 12,300 cu ft. Two of these will be manifolded to give a storage potential of 24,600 cu ft of oxygen. The switch over from the empty to the full cylinder will be made automatically.

Besides gases, National handles a complete line of welding products, specializing on cylinder trucks, torches, regulators, spark lighters and other products for gas welding and cutting. Many of the products handled are put out under the company's own brand, and several of them are made by National's manufacturing division.

Benefits for Employees

Any company is only as good as the men who work for it. Jimmy has instilled the "happy family" attitude among his 56 employees. The company has a credit union and also a profit-sharing plan. The credit union was organized as soon as the company had the "over 50" employees that the law requires. Its fund has never suffered any loss, and savings have increased steadily.

All National employees participate in the profit-sharing plan from their first day of employment. Under this plan, the trustees use 33⅓% of the yearly allocation to pay life insurance premiums on the employees. These policies provide pension funds that will match social-security benefits at age 65.

Retirement age is still a long way off for most National employees, only two of whom are over 50. Their average age is 35. Jimmy himself is no more than 43, so you can figure out how old he was when he started the business 14 years ago.

The present sales force consists of six salesmen and four manufacturers' agents. Salesmen are paid a salary plus commission, and all but one are furnished cars. The first salesman hired, L. B. Mann, is still with the company. Also on the sales force are two other "oldtimers," Jimmy Martin and Jimmy Drye. Jimmy is evidently a magic name at National Welders.

To deliver the orders that these men bring in, the company operates nine trucks.

Present chiefs are:

N. A. Douglas, sales manager for the industrial division; Howard Turner (Jimmy's brother), in charge of the medical gas program; Jack Bennett, secretary-treasurer; and Bill Wolff, advertising manager. These men are all given pretty much of a free hand in their own departments. Jimmy believes that the best way to run a business is to hire good department heads and let them do the job in their own way so long as they are getting results.

He also believes that the best way to get a man to do what you want him to do is to show him after you tell him. When it comes to selling, Jimmy works along with his men at times to teach them how it's done. This method has brought wonderful results in developing salesmen.

Always restless, Jimmy is now planning an expansion program at his Florence, South Carolina, branch. The next problem he will have to solve is where to sit down and where to hang his hat in the home office. He's out so much, calling on customers, that the boys at home don't see why they can't get some good out of his vacant desk and office.

. . . never any guessing at Vaweld as to what items are currently in stock . . .

BUSINESS FORMS starts on p. 39

cils, notebooks or other items that do not cost more than 10c each. A small ad is carried in all classified telephone directories of towns within a radius of 100 miles from Charleston. No newspaper or radio advertising is used.

Doing a business of over $500,000 a year, the company has 675 large cylinder gas accounts, 740 small lease cylinder gas accounts and nearly as many non-gas customers as both gas classifications put together—a total of around 2,600 accounts.

Nearly every product sold by Vaweld has the company's diamond trademark on it. Sometimes the manufacturer's tradename is supplemented by the prefix: "Distributed by Vaweld." On many items, however, the Vaweld tradename is used without the manufacturer's name—welding hose, friction lighters, flints, welding goggles, safety goggles, weldors' gloves, etc. The company's private brand is imprinted on such items by the manufacturers before the shipments are made. Needless to say, the Vaweld trademark is registered and fully protected so that it cannot be used by others.

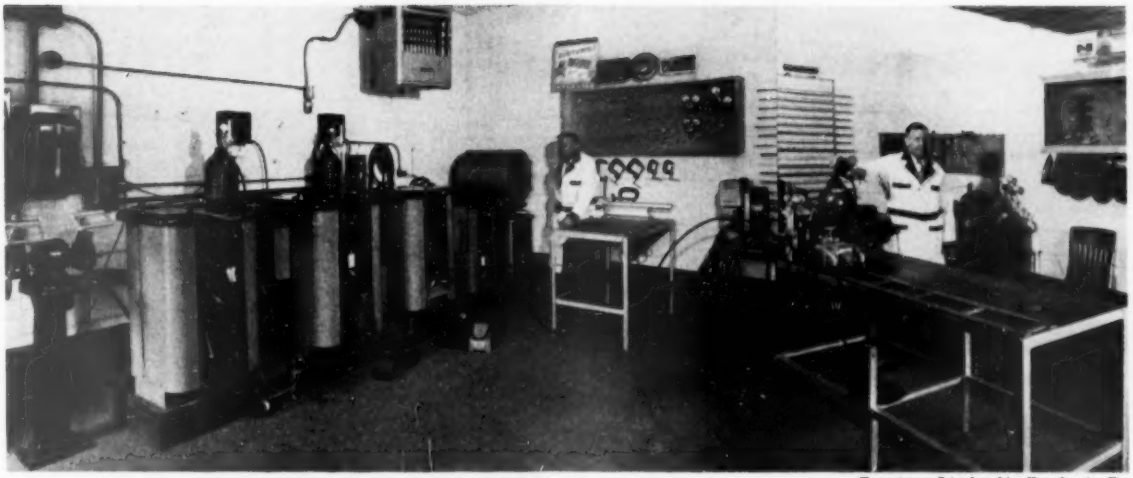
Rice is continually adding items to those merchandised under the private label. He has his own specifications for lighters, lenses, goggles, etc. as he feels that this gives him greater control over quality. The Vaweld organization is rather fussy about quality, anyway. Bill once sent 2,200 lb of high-alloy electrodes back to the manufacturer because the ends were not properly brushed.

Before a new item is added under the company's tradename, it is tested in the repair department. The product is checked by Rice and by anyone else in the organization who might have special knowledge pertaining to that product. The product is then taken out into the field and samples of it are left for test service with selected customers. The company checks regularly on the progress of such tests. Rice always pays the manufacturer for the merchandise that is so tested. He wishes to be entirely free of any obligation to purchase merchandise that doesn't come up to the company's exacting standards.

A few words should be added here about the company's method of inventory control. An inventory file system makes it possible for Vaweld to keep track of stock right up to the minute—there is never any guessing as to what is in stock. If an item doesn't move, it is moved out to make way for those that do. Better than a $90,000 inventory is carried, with an average turnover of above five times a year.

In conclusion, it should be stated that Vaweld is not a one-man organization but a team with collective ideas. Hundreds of ideas are tried and discarded every year, but out of this trial-and-error program an occasionally really good idea presents itself such as the cylinder control system previously outlined and the format for the company's catalog.

Vaweld employees are loyal and like their work. They carry their full share of the executive load and relieve Rice of enough responsibility so that he is free to serve in such exacting jobs as president of the National Welding Supply Association.



Courtesy Linde Air Products Co.

Laboratory for Welding Sales

"He asked me to take him over to his competitor's plant," said the welding distributor salesman. "Said he wanted to see the equipment in action before he made up his mind to buy. Imagine my embarrassment!"

It was to avoid such embarrassing situations that Glenn Odren, of Welding Gas and Equipment Co., Detroit, decided to set up a demonstration laboratory.

The best way to sell the prospect a new idea in welding, Odren reasoned, is to show him how his particular job may be done. This is usually difficult to accomplish, however. Of course, welding equipment can always be moved into a plant, but this involves: (1) moving in demonstration equipment; (2) moving it out after the demonstration; (3) moving in new equipment if the demonstration has led to a sale. All of this moving around definitely consumes a lot of the salesman's time and may also be quite expensive.

Very often the customer's plant does not lend itself to efficient demonstration of the apparatus or process involved. The equipment being demonstrated may be crowded into the working area in such a manner as to allow little opportunity to show it off to the best advantage. When a demonstration is made under such handicaps, it may result in losing the sale.

The answer that Glenn Odren finally came up with was to set up the various types of welding equipment he sells in a special room off the sales floor. This room was to be a demonstration laboratory where a customer could bring in an experimental job and work out shop procedures.

As an example, suppose a customer is doing aluminum welding with torch equipment. The salesman believes that the particular job might be better done with Mig or Tig welding. Obviously, the thing to do is to bring samples of the work to the laboratory, weld them by different processes and then determine by comparative tests which process is best.

Equipment for Service

When this dream of Odren's finally came true, a 15 by 21 ft space was converted to an experimental laboratory for customers and prospects. There is available a pedestal grinder, five arc welders, an electrode drying oven, cylinders, regulators and torches for oxyacetylene welding and cutting and a flame-cutting machine. Two of the five arc welders are set up for inert-gas welding. The remaining three include an a-c transformer welder and two d-c rectifier welders. Wall displays showing other types of equipment sold help to sow the seeds for future business.

The facilities of the lab are made available to customers mainly through salesmen and servicemen contacts. The only restriction placed on the work done in the lab is that it must be of developmental or experimental nature. Either a salesman or a serviceman is present during every experimental project. If the problem involved is beyond the scope of the salesman or serviceman, a factory representative is called in to assist in the development and furnish technical advice.

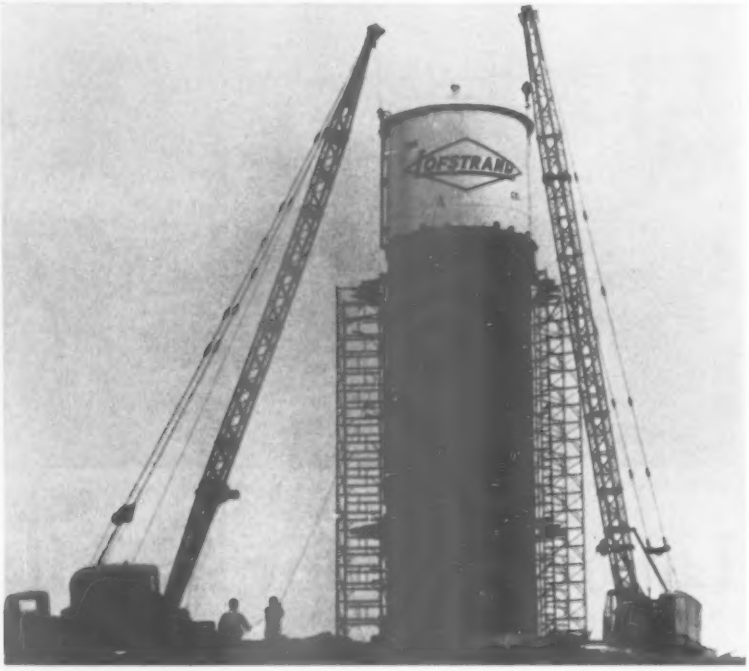
Now that this experimental laboratory has been in operation for six months, Glenn Odren feels that it is really paying off. Hardly a day goes by without at least two or three customers making use of it. Normally, the laboratory is open only during the regular working day, but there is no reason why it cannot be kept open after hours to meet unusual circumstances.

Since all the demonstrations in the laboratory are with complete units of apparatus, the customer can readily see what apparatus is required as well as how it does the job. It is easy to sell all the accessories when they are set up and shown as necessary to do the job.

Another nice feature of the laboratory set-up is that processes competitive to one another can be tried out side by side, thus assuring that the most economical and practical method will be selected. And sales of other equipment are stimulated merely by the fact that the apparatus is in the room and exposed to the customer's attention.

From This

To This ⟶



Standpipe Moved 50 Miles

Salvage of a 30-year-old tank resulted in the saving of thousands of dollars. But it wasn't the easiest thing in the world to move a water tower 64 ft high.

BY T. B. JEFFERSON

WHEN the Lofstrand Co. was making plans for its new plant at Rockville, Maryland, the management realized they would need a standpipe to provide for the plant's water needs and fire protection. About 50 miles away, in Brunswick, Md., was an old, abandoned standpipe that would do perfectly. It could be bought for a fraction of what it would cost to build a new standpipe. But where would the saving be after the old standpipe had been torn down, transported across country and reassembled? Would the charges for the moving operations increase the total cost of the old tank to the point where it would prove unprofitable? The management couldn't say.

Realizing that some expert advice would be needed upon these questions, the Lofstrand officials called in Bernice and M. E. (Mac) McPherson, the proprietors of the B & M Welding & Iron Works, Gaithersburg, Md. The McPhersons looked over the standpipe at Brunswick, Md. They saw that the old standpipe was of riveted fabrication, erected in 1924. The horizontal seams were lapped with a single row of rivets; the lapped vertical seams were held together by a double row of rivets. The tank was 17 ft 4 in. in diameter and 60 ft tall plus a 4-ft conical roof that brought the total height to 64 ft. The bottom tank plates were 5/16 in. thick and the top plates were 3/16 in. thick.

The McPhersons decided that there were three things they should do first:

(1) Make a thorough examination of the inside of the tank to see how much it had rusted. Perhaps it had rusted to such an extent that it wasn't worth salvaging.

(2) Obtain a sample of the steel in the tank and test it metalurgically to make sure that it could be welded.

(3) Check to see if it was possible to obtain road permits and clearances to transport sections of the standpipe along the highway.

The first two steps were easily accomplished. It was determined that it would be worthwhile to salvage the tank and that the steel could be readily welded back together once it had been hauled to the new site. The job of getting it to the site, however, was going to prove a difficult one.

First, it was necessary to make a road survey of low bridges, wires and other obstacles. This called for the coöperation of the telephone company, state highway department and local police of the towns through which the cut-up sections of tank would have to be hauled. From this survey, the McPhersons determined how much flame-cutting would have to be done on the standpipe.

15-Foot Sections Needed

Because of low bridge clearance, the McPhersons learned, it would be impossible to haul anything over 18 ft. high. Since their low-bed trailer was about 2-ft. 10 in. off the road, the tank would have to be cut into 15-ft sections. Even 15-ft sections would have a from-the-road height of 17 ft 10 in., which certainly didn't represent too much

clearance. The law offered further difficulties. It was permitted to transport only two sections at a time, and police escorts were necessary after all the local permits for hauling had been obtained.

To cut the tank into four 15-ft sections (exclusive of the roof), three circumferential cuts were required. Cutting was done from the bottom upwards—a way that many people would consider backwards. By doing it that way, however, they saved considerable crane rental time. The trick, of course, was to hold the cut sections of the tank together until they could be dismantled all at once.

The big problem of the flame-cutting operation was to stay away from the horizontal riveted seams. Fortunately, the tank was so built that all the cutting could be done approximately 12 in. from a horizontal seam. Vertical seams were likewise avoided. Using a hand cutting torch, the operator simply jogged around the double rows of rivets in the vertical seam without trying to make a straightline cut. In fact, the first cut was laid off with a yardstick, and the start of cutting for the first section was 15 ft from the ground.

Cut Sections Kept Together

How was it possible to cut the bottom section first without the tank toppling over? The secret was in the clips welded to the standpipe for realigning the tank on assembly. These clips also served to hold it together during the disassembly flame-cutting.

One of these alignment clips (Figs. 1 and 2) consists of two pieces of ½ by 3 in. flat bar stock 5 in. long and a third piece of the same stock 11 in. long. The shorter pieces were tacked about ¾ in. from the edge of the 11-in. piece, leaving a 1-in. gap between the two ends at the center. This tack-welded assembly was then drilled for four ⅝-in. bolts. Two holes were drilled in each of the 5-in. pieces so they could be bolted to the 11-in. piece.

The alignment clips were now ready for welding to the shell plates. Before any welding was done, however, the circumference of the standpipe shell was marked off at 5-ft intervals. At each of these marks, a flame-cutting operator cut the shell for about 6 in. on each side. The clips were then welded in a vertical position to the tank shell at the marked intervals. The clips were so spaced that the flame-cutting was about in the center of the gap between the two 5-in. lengths of bar stock.

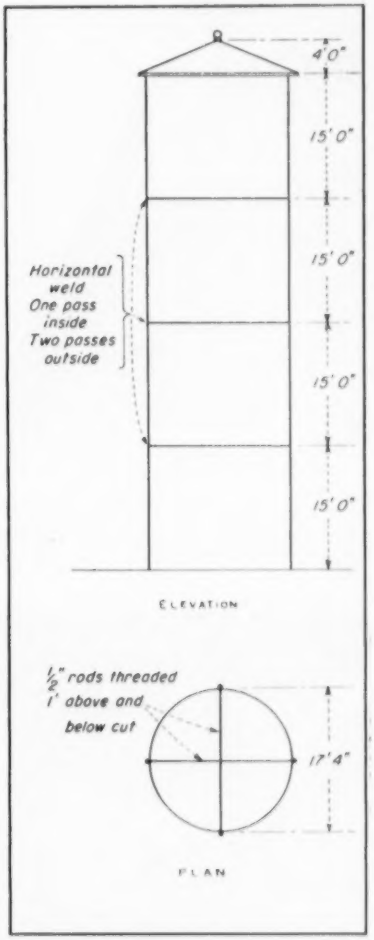
Lifting and Loading

For lifting the tank sections, two pieces of angle 1 ft long and approximately 1 ft 6 in. apart were welded vertically to the tank about 1 ft below the line of cut. Also at this point, two ½-in. rods (Fig. 4 plan) were run through the diameter of the tank at right angles to each other to keep the circular cross-section from becoming egg-shaped. Holes for the rods were flame-cut with the oxyacetylene torch. Washers and nuts were fastened on the rods on the outside. To keep the tank section from being crushed during lifting, a 12-in. I-beam spreader was placed at the open end of the sections.

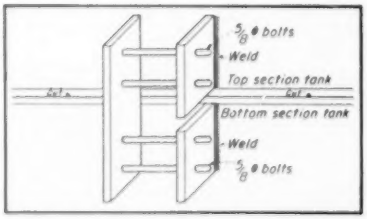
After all the flame-cutting had been done, the lifting brackets welded in place and the "hogrods" affixed, all was ready for the cranes to take the tank apart. As the crane hooks were affixed to a section, the tack welds and bolts which had held it to the next lower section were removed.

(Continued on page 53)

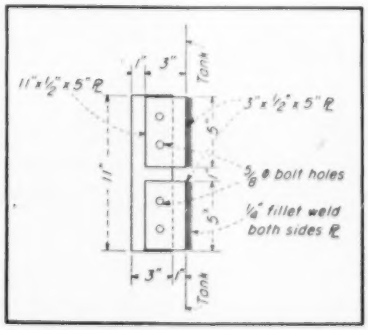
Welded clamps hold tank together when flame-cut



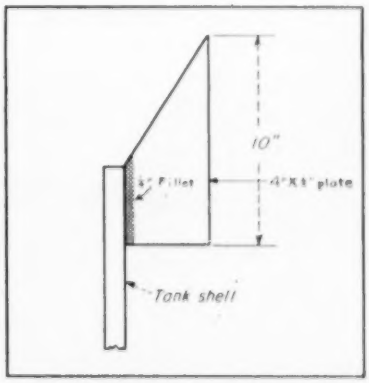
4—ELEVATION indicates where cuts were made and where sections were later welded together. Plan shows how tie rods were placed



1—RELATIVE position of alignment clamps. Note how grooves were left to allow flame-cutting



2—DOGS used to hold and align tank during the flame-cutting and subsequent welding for reassembly



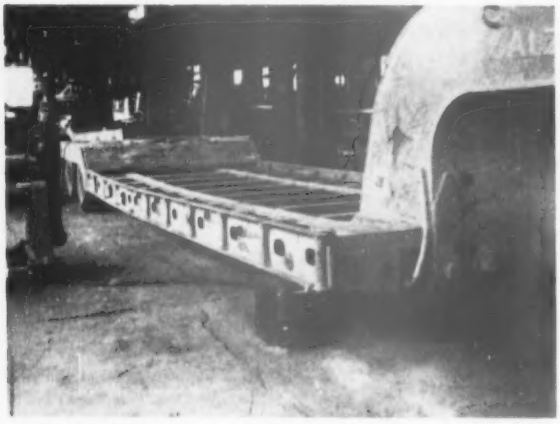
3—TAPERED plates at top of a section guided the section immediately above it right into place

"Grass

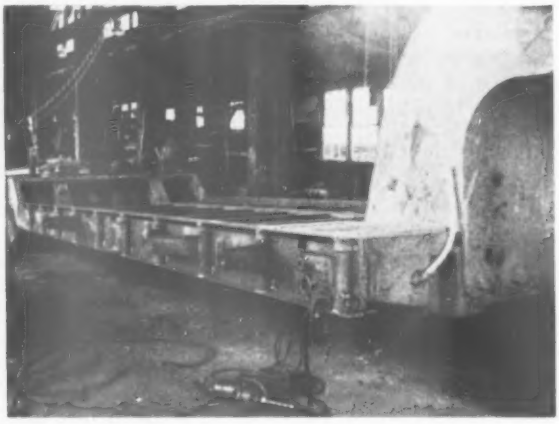
BEFORE **AFTER**

Several posts on the bridge were bent at the junction with the sway frame like that on the left. The whole bridge had over 100 damaged members. All were straightened by the oxyacetylene torch—with the members in place

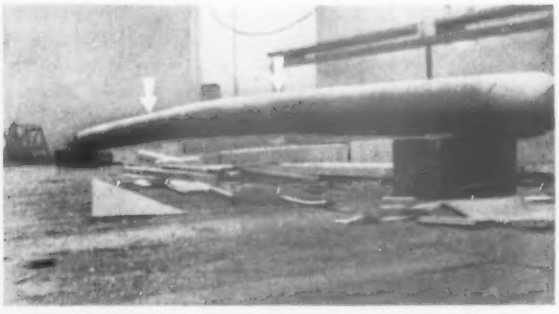
JOSEPH HOLT'S success in the straightening of damaged bridge members has saved the highway departments of Washington and Oregon thousands of dollars. Yes, we'll admit that this article may be controversial — read it and judge for yourself.



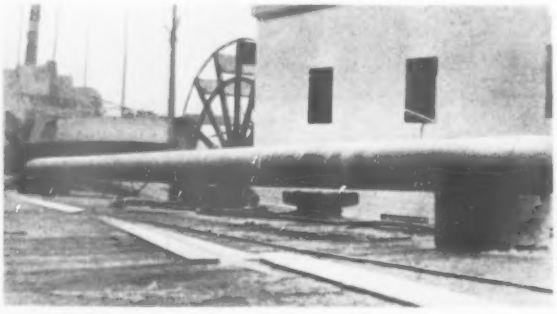
BEFORE **Straight when welded, the trailer sagged and took a permanent "set" of 4½ in. when loaded to only one-third of its figured capacity**



AFTER **Oxyacetylene torch reversed stresses, placing them against the load. When loaded to 150% of its figured capacity, the trailer sagged only ½ inch**



BEFORE **Army Engineers wanted to use this spud on the "snag boat" *Preston*. It had two "dog legs" (arrows)**



AFTER **"Impossible!" said the shop. "Easy," declared the torch operator. After a treatment, spud looked like this**

Roots" of Stress Control

BY JOSEPH HOLT

LET'S take a short steel bar that is supported so that it is free to expand in all directions. We will heat it uniformly to a temperature of, say, 300 F. Under this uniform heating, the bar expands uniformly, and each of its dimensions increases by about 0.2%. There are no stresses. Now we let the bar cool to room temperature. Contraction takes place as freely as did expansion. All three dimensions return to their exact original values. Again, no stresses are produced.

Suppose that the same bar is held between rigid blocks. As before, we heat it uniformly to the previous temperature of 300 F. The bar again attempts to expand uniformly in all directions but cannot. The rigid blocks keep it from expanding lengthwise. The former 0.2% elongation does not occur. Instead a compressive stress is produced against the ends of the bar—the same type of stress that would occur if the bar (unheated) were to be compressed by mechanical means to within 0.2% of its former length. That stress would amount to about 60,000 psi if something else did not happen.

The Steel Yields

Ordinarily, something else does. The elastic limit of mild steel is usually below 60,000 psi, and so the steel yields. The bar is thickened to compensate for the lack of thermal expansion lengthwise. Upon cooling, it is left slightly shorter and thicker than it was before. However, there are no stresses in it.

Let us now suppose that the compressive stress we produce by heating the bar between rigid blocks is sufficient to cause the steel to yield, and let us also suppose that the bar on cooling is restrained so that it is not free to shrink in length. What happens then?

What happens is that the compressive stress, which caused the bar to upset or yield, changes to a tension stress as the bar cools. When the bar has completely cooled, this tension stress will remain as a "residual" or "locked-up" stress.

Admittedly, the above examples reduce the problem to its very simplest and most elementary terms. Expansion and contraction of metals resulting from a change of temperature are commonly understood. Very few, however, realize the enormity of such residual stresses. Eventually, something must upset, stretch, distort, move or break to satisfy the stresses that are created as a result of temperature changes. Wherever heat is applied, shrinkage occurs upon cooling—or stresses are created if shrinkage cannot occur. And heat must be applied when welding is done, whether it be arc welding, gas welding, resistance welding—any form of welding except the so-called "cold" welding.

The reader must realize that after the weldor has left off the residual stresses of tension will be at yield point during cooling. This should give him an inkling as to what means need to be utilized to control these stresses and to straighten the heat-distorted members after welding. Straightening is simply a matter of the proper application of localized heat along an edge that needs to be shortened. The locally applied heat causes expansion, yielding and upsetting, after which the straightening is accomplished by the contraction that occurs during cooling. Judicious hammering sometimes helps the process along.

Our engineers and designers must know and thoroughly understand stress control, shrinkage and distortion if we are to avoid residual stress trouble before it starts and gain greater strength and longer life for our ships and weldments. Corrective measures are very costly and can contribute to failure of the weldment later on.

Problems Will Shrink

Let me quote from a talk made by my friend J. R. Stitt, research and welding engineer of R. C. Mahon Co., Detroit. Speaking at the 1952 conference of the American Institute of Steel Construction, Inc., Mr. Stitt said:

"If you will learn to control shrinkage, your welding problems in fabrication and erection of structural steel will shrink. They will shrink to a minimum. If you will learn to control shrinkage, your welded structural members as well as the completed structure will have the correct dimensions."

Contrariwise, if residual stresses are not controlled, the finished weldment will be distorted—beyond sightliness if not beyond usefulness. Cracks may occur, and repair can add other damaging loads to the already overstressed structure. It can all add up to a future failure; perhaps, in the case of a ship, to much loss of life.

However, these stresses can be controlled and put to useful work.

My son Richard and I have succeeded in straightening many damaged bridge members by using the "Holt Method of Heat Application." These repairs were accomplished without stopping traffic and with the member in place carrying its designed load in the structure. Our method invariably resulted in great savings to the state or county owning the bridge.

Can Help Carry Load

Carrying on with our pioneer experimenting, I have expanded the original theory by sequencing welding to control residual stresses and make them oppose the load to be carried. If the residual stresses are properly placed, they can be made to increase the load-carrying capacity of a structure. This is better than stress relief.

The first really large member I straightened was in 1920. It was a very heavy I-beam, of considerable length, intended for use as a railroad bridge girder across a small river. This bent beam for two weeks defied all efforts to straighten it by using oil torches and all available force.

My past experience had convinced me that oil torches could not raise the temperature at the point of bend high enough to make it yield to the applied force. I reasoned that the confined heat of the oxyacetylene torch could induce stresses and straighten the member without outside force.

BEFORE **Dipper sticks and ladder were a mess and unfit for service. Now see what the torch did for them**

AFTER **Same ladder, same dipper sticks as on the left. But what a difference! It's all in the proper use of heat**

However, I could not get permission to try because the use of oxyacetylene torches had been banned.

He Disobeyed Orders

I was so sure of my theory that while the men were at lunch, I took a chance and disobeyed orders. The oxyacetylene torch did the trick without any outside force being added. The painters brushed the member and painted it. It went into the bridge and was almost forgotten.

The same principles used to straighten members can be used equally well to bend members. Distortion in weldments can be corrected or avoided. Residual stresses can be reduced to a minimum during fabrication. Furthermore, those stresses can be made to oppose whatever load the finished weldment is to carry, be it a small test specimen or the largest of welded ships.

Such statements may seem far-fetched, but they are true.

Why Failures

Steel is so good and welding so strong and reliable, if properly done, that a steel weldment will hold if given only half a chance. Some weldments do not get even that half a chance, however, and so fail. I do not believe that we are learning enough from the failures. To be sure, we correct some abuses, but we do not make full investigations into the real cause of the trouble.

If a ship or other weldment has failed, a careful investigation of the welding procedure used in building the structure will usually give the reason. The answer will nearly always be: "improperly placed residual tension stresses."

These misplaced residual stresses are usually at points where other contributing factors concentrate to insure a failure. In the case of ships, action of the ocean waves increases the load in the overstressed tension points. A drop in temperature contributes. So does work hardening, caused by vibration. "Notch effect" because of construction or design faults and repeated local elastic deformation from service conditions will both add to the possibilities of failure. To my mind, however, the greatest single contributing factor is tension stress on the edge of a member or element. And this results from lack of stress control during construction.

We hear that "residual stresses have no bearing on ship failures." This statement comes as a result of much research. My own experience leads me to disagree. Actual practice over many years in the field of welding has proved to me that failures are *the result of uncontrolled stresses induced by improper welding procedures.*

Four Case Histories

In support of my stand, I offer the following incidents:

1. A weldment spanning 37 ft was straight, but all the residual stresses wrong because of improper "directional welding." When loaded to one-third the figured capacity, it sagged and took a permanent set of 4½ in. out of line. The stresses were reversed by the proper application of the oxyacetylene torch and placed against the load to be carried. The weldment was brought back to ½ in. above the original alignment. Loaded to 150% of the figured capacity, it sagged only ½ inch. When the load was removed, the weldment returned to the ½ in. above the original alignment.

2. A heavy I-beam member on a ship extended from the bottom vertically through all decks. All parts of the ship's structure joining this I-beam were welded to it according to present-day procedures. Those procedures were wrong for the places and conditions. Because of the wrongly placed stresses, the bottom of the hull was depressed considerably. It had to be faired up, and plans were afoot for considerable cutting to be done on the bottom end of the beam and some of the adjoining members. "Contraction as a friend in need" came to the rescue. Heat from the torch reversed the stresses and the bottom plates came to their proper alignment.

3. On the captain's quarters of a ship, all the welding stresses were wrong. The steel was trying to distort, but the shape of the quarters was such that there was not enough force to make the distortion take place. Later on, some more welding was required. On the starboard side, the welding was done so that its stresses opposed the already existing stresses. There was no distortion.

A request was made that the same method be used on the port side of the ship. The request was not granted. The weld made on the port side added more stress to the already overtensioned structure. Distortion occurred to such an extent that it took two good men two and one-half days to bring the port side back to proper alignment.

The actual welding time required to cause that much distortion was only twenty minutes.

4. A big hot water tank was installed in one of our country's largest candy and biscuit manufacturing plants. When hot water was drawn off for a "mix," cold water rushed in at the bottom below a baffle plate. This heat condition caused rapid contraction on the bottom while the top of the tank was still hot and so in an expanded condition. As a result, a crack formed in the bottom of the tank. It was twice repaired, and each time the bottom cracked again. Each time the crack extended farther.

In the case of the first two repairs, welding was done without stress control. The third time stresses of tension were controlled. That tank has since seen many years of perfect service.

To Reduce Ship Failures

The regular waterline of a ship cannot be definitely located in construction because stress forces exert themselves when the ship is floated. If there are wrongly placed residual stresses, the steel will be loaded to its yield point when the ship is riding the crest of a wave in service.

If the construction stresses are controlled and placed against the load to be carried, the stresses on the vital points of the ship must change from compression to neutral to tension before any dangerous condition can exist.

In particular, tension on an edge or corner is very undesirable. Try to tear a piece of paper by pulling against its center. Then try to tear it by pulling at an edge. This is effective though simple proof that tension on an edge can be dangerous. If the edge or corner is continuously in elastic movement from vibration, as it is in service in a ship, work hardening takes place and eventually a brittle failure.

How can such failures be avoided? How can distortion in our structures be minimized? The only answer is that designers, draftsmen, superintendents, foremen and all leadmen must know how to use stress control during construction.

The educational problem, while great, is not nearly so hard as it seems. The fundamental principles are not difficult to understand.

Every point in a welded structure must be free from defects if "notch" and "edge" effects are to be avoided. Every weld must be done with the aim of controlling residual stresses to the greatest extent.

Once engineers, designers and draftsmen fully understand the effects of welding stresses and know how to control them by directional welding, a complete procedure will be put on every drawing. Then the supervisors and their weldors have only to follow those plans carefully, and ship failures will be eliminated. The cause of failure can be avoided before the ship's keel is laid.

I do not claim that the methods for stress control have been fully perfected. The subject requires the careful consideration, discussion and coöperation of our entire industry. Much further research will be necessary. However, this research will prove fruitful.

It is high time to get down to the "grass roots" of this stress control problem.

STANDPIPE MOVED

(Continued on page 49)

Two cranes were used to lift the five sections. The first piece to be removed was the roof, then the top section and so on. As the sections were lowered, they were loaded on the trailer. Once a section had been set on the trailer, four pieces of angle were welded across the top diameter, coped and bent down so as to allow low wires to slide over the top of the tank section. Each section received this treatment as it was loaded onto the truck.

Hauling proceeded without incident so well had the prelimary planning been done. When the four sections and the roof were received at the Lofstrand plant in Rockville, they were blocked up so that the sections could be reinforced and repaired before reassembly. During this period, tarpaulins were placed over the top of each section to protect them from the weather.

Rust pits were repaired by arc welding. In two or three places, these pits were from ½ to 2½ in. wide and 8 to 10 in. long. Mostly, however, the pits were about the size of a quarter or smaller.

During the winter, the ground did not freeze sufficiently to permit working on the base of the tank. The sections remained under tarpaulins. Not until spring, when dry weather finally came, were the welding crew and other construction workers able to get busy at the base of the tank, which was on a hill in a wheatfield.

One of the first things done was to grout the bottom of the tank in concrete to a depth of about 1 in. This protected rivet heads. After the grout had thoroughly dried, the anchors were cinched, and the next two sections of the tank were set in place. To assist in aligning the sections, six tapered bars (Fig. 3) were welded to the upper rim of the first, second and third sections at intervals of 60 deg. These sloping plates acted as guides, causing the upper section to slide in accurate position atop the lower one.

No Welding below 50 F

The circumferential welds joining the sections together were made with 5/32-in. E-6010 electrodes. First one pass was made on the inside; then two passes on the outside. In the early spring, welding was sometimes delayed as the contract for moving the tank had specified: "No erection welding is to be done after the temperature has dropped below 50 F." This precautionary measure was felt to be necessary because the welds were made either through riveted seams or adjacent to them.

While the lower sections of the tank were being erected, the top section was being painted and lettered with the company's name. Finally everything was all set. Using two cranes, the top section was lifted into place. On completion of the top welds, the tank was pumped full of water and inspected. No leaks were found, and the job was accepted.

Moving of the old standpipe saved the Lofstrand Co. thousands of dollars. It shows what useful tools are the cutting torch and welding electrode. You can never tell just how or where they may be needed.

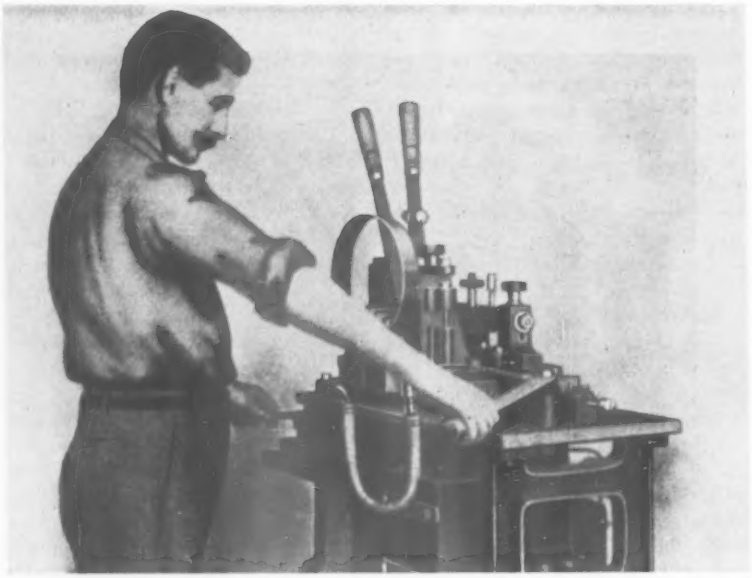
Preston M. Hall

THE AUTHOR of this article is himself one of the pioneers of resistance welding. Preston M. Hall joined the Thomson Electric Welding Co., Lynn, Mass., as experimental engineer in 1920 and in 1923 helped to found the Taylor-Hall Welding Corp., of Worcester, Mass. He was president and shop manager of this concern from 1923 to 1943. In 1928 he purchased the Taylor interests and became the majority stockholder.

At first the Taylor-Hall Welding Corp. did only job welding. Later it purchased and rebuilt used welders, still later designed and built its own line. During the period between 1920 and 1943, Hall was granted 18 United States patents on resistance-welding machines, methods and products.

During World War II, Hall served in Washington as chief of the Resistance Welding Section of the War Production Board. In June, 1945, he was sent by the War Department to England, Sweden and Germany to make a study of resistance-welding techniques and machine designs.

The Taylor-Hall Welding Corp. was sold to the Federal Machine and Welder Co., of Warren, O., and was set up as a subsidiary concern under the name of the Taylor-Hall Welding Co. of Ohio. Hall retired in 1948, but the industry would not allow him to rest. In 1951 he took over the administration of resistance welding for the National Production Authority, and he's still in Washington at the present writing.



1—IN 1890's the only resistance-welding method was "slow" butt welding

77 Years of

If you want to know what's coming in the future, it might be a good idea to look back upon the past. Here's a historical summary that's both concise and readable.

BY PRESTON M. HALL

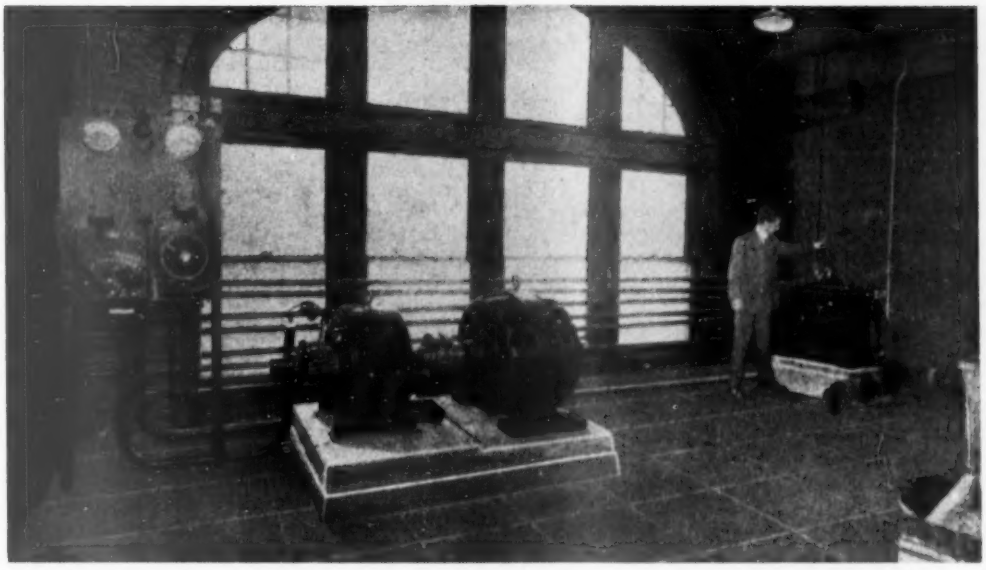
LIKE so many fortunate inventions in our present-day civilization, the discovery of resistance welding was accidental. It was first revealed to the world on Wednesday, Nov. 16, 1877, when a 24-year-old electrical genius read an original paper at the Franklin Institute in Philadelphia. His paper thus described the first experiment that led to the birth of resistance welding:

"After showing the induction coil as so used, I reversed the process and passed high potential discharges from a charged battery of Leyden jars through the fine wire coils of the induction coil and received currents of low potential but of great volume from the coarse wire of the coil. While repeating this instructive experiment, showing the identity of electricity and the reversibility of the induction coil, I noticed at one time that after the discharge the ends of the wire of the primary or coarse coil had stuck rather firmly together, and it then occurred to me that possibly metal might be united by properly organizing the appliances."

That young experimenter was named Elihu Thomson, and he was destined to vie with Thomas A. Edison as being the world's leading inventor and developer of electrical mechanisms. A partial list of Thomson's brain children includes: generators, motors, lamps, lightning arresters, circuit breakers, meters, welders, insulators and transformers. He was granted 97 patents on resistance welding alone, a search in the patent office reveals. Thomson also received many awards, the most outstanding of which was the Lord Kelvin medal in 1924 for world pre-eminence in electrical engineering.

FIRST PATENT IN 1885

It was not until 1885 that Professor Thomson found time to build the first resistance butt welding machine, now on display in the Franklin Institute. He also took out the first United States patent on this process, the first claim of which reads in part: "The herein described art of effecting



2—INSTALLATION of a welder required use of an alternator, rotary converter or motor-generator

Resistance Welding—I

union between two pieces of metal, consisting of holding the same in contact at the point of union and simultaneously passing a current of electricity through the joint of a power to fuse and unite the pieces . . ."

It should be noted that this claim is very broad and covers all forms of resistance welding. Years later it was the deciding factor in very important litigation.

In 1888, Thomson founded the first company to make and license the use of butt-welding machines. For about eight years, The Thomson Electric Welding Co. had the field to itself. Only "slow" butt welders were made. The "slow" butt-welding method is illustrated in photo 1, a reproduction from a publication of the time.

The sequence of operation was: clamp the workpieces, apply pressure, apply current, push up and cut off the current at approximately the same time. It resulted in a relatively large rounded bulge at the weld area. The process required considerable skill and judgment on the part of the operator since he had to steer between a "cold" upset, wherein the pieces were merely forged and stuck together, and an overheated weld area, in which the metal became spongy because of the excessive heat.

Welding technique was only a small part of the early user's troubles. Since available power was then almost universally direct current, the installation of a welding machine also involved the use of an alternator, a rotary converter or a motor-generator. Photo 2 shows a typical oldtime installation.

Limit Was 60 Kw

It is interesting to note that in those days a 15-kw machine was the average size; 25 to 30 kw machines were considered large; 50 to 60 kw was the limit that could be connected to existing service. Mr. James A. Muir, one of the co-founders of the second company to enter this field, relates the following incident:

"When John and Horace Dodge built their first automobile plant, they installed 67 welding machines, ranging in size from 15 to 60 kw. The one 60-kw machine was for welding flanges to rear axle housings. This welder proved too small and a 100-kw machine was built and installed. It was found to be adequate but none too large. The trouble was it continually blew the main fuse, which resulted in the power company threatening Dodge Bros. with cutting off their power supply unless the welder was disconnected. John Dodge was a fighter, however, and the power company soon decided to give him adequate power. He had broadly hinted that he intended to build his own power plant."

Resistance welders are still having their troubles with power companies, but the utility men of today are greatly more coöperative.

In spite of its early difficulties, the resistance-welding industry grew. Two more companies were founded in 1896, one in 1898, one in 1902, one in 1914, two in 1918, one in 1922 and one in 1923. By 1923, there were ten manufacturers of resistance-welding equipment. Today, there are over 60.

The first resistance-welding process to be developed was butt welding, but spot welding soon came into fairly common use. Some of the pioneer users of this process were: The Budd Co. (auto bodies), The Truscon Steel Co. (steel columns) and The Barney & Berry Co. (skates). All of these companies were employing spot welding as a production process prior to 1915.

Many troubles still beset the resistance-welding industry, however, the chief of which was long and very bitter patent litigation. I'll tell you about that next month.

(To Be Continued)

Tony was hopping mad. He was chasing Ket with that big hammer and screaming, "You sonovagun! I keel you! I keel you!"

Ket's Cracks Lose Bet

Ket liked wisecracks but not the cracks that you shouldn't get when you are welding on cast iron. Tony may have been the goat, but he sure delivered the last butt.

BY CLEMENT HOWARD

EVERY owner of anything that floated from a skiff to a 52 footer wanted his boat in the water for the three-day Decoration Day holiday. Kettlehead should have been working underneath a big cabin cruiser on the ways, but instead he was plotting the treatment to give a guy named Tony.

Ket was sitting on the ways pounding a chisel and driving it into a wooden beam. His eyes were closed. "What you doin'?" Tony asked.

Ket yawned nonchalantly. "This ain't as easy as you think. I'll bet you four bits you can't hit the chisel ten times straight!"

Tony didn't say anything at the time but disappeared for about ten minutes for a little private practice. Pretty soon he came back and informed Ket he'd take the bet.

Ket said, "You have to put my hard helmet over your face with one hand and pound with the other."

The point of the whole thing was that Tony had just bought himself a fancy new suede leather sock helmet, which was lying close by. As soon as Tony's face was covered, Ket placed that new leather helmet over the head of the chisel. Tony did very well hitting the chisel, and each time he hit it, Ket moved the helmet a trifle. Tony made a very pretty design.

Tony removed Ket's hard helmet from in front of his face and asked, "Do I winna da bet?"

About that time he saw his perforated helmet.

"You ruin my nisa new helmet," he yelled. "Now I keel you!"

There was a look in his eyes like he meant it, and Ket didn't stop to find out. Tony ran after him with that big hammer still in his hand screaming, "You sonovagun! I keel you! I keel you!"

The last anybody saw of Ket for several days was the sight of his shirttail flying in the breeze as Tony chased him off the dock. He really would have been murdered if Tony had caught him.

Tony cooled down finally, but Ket continued to give him a wide berth. That joke had sure backfired. A month or so later, though, the gang saw Tony gesticulating in a friendly way to Ket and wondered what was bringing them back together on cordial terms. Pretty soon the secret was out. Tony had a bet on that Ket couldn't weld cast iron and mild steel together with a mild-steel electrode without the cast iron cracking. The pay-off was to be a new sock helmet.

The deal was that Ket was to weld a mild-steel angle bracket to a cast-iron pump casing. The weld had to be at least 8 in. long, and any cracks in the cast iron would lose the bet for the weldor.

Ket was plenty cocky and bellowed at everybody in his usual manner. He wanted everybody to autograph the helmet he was going to win. All the guys gathered around to watch the contest. Three fellows appointed themselves a committee to insure fair play. Old Ket took some mild-steel rods and started to weld. He skipped back and forth as he should have and only welded a few inches at a time, but it wasn't long until the iron cracked with a ping. Then came another ping and another, etc. until the shop sounded like a bell factory. Ket had to concede defeat but, being Ket, he wasn't going to pay up for the helmet if there was any way out.

"Bet you can't weld it either," he said.

"Okay," Tony agreed. "I winna two helmets."

Tony stepped up with several electrodes in his hand. The committee examined them, and the three members were in agreement that all Tony's rods were mild steel. Tony welded an inch and a half and then skipped to another spot and did the same thing. Each time he let the part cool until he could hold his hand on the first pass. When the bracket had been welded the full eight inches, not a sound had yet been heard. Ket took a hammer and pounded the weld . . . no pings. No cracks could be found either.

Ket was always a poor loser. He swore Tony had used machinable nickel electrodes, and Tony challenged him to file through the welding bead. Ket couldn't. It was mild steel, all right, and finally even Ket had to admit it. He autographed the new helmet he'd bought and reluctantly handed it over.

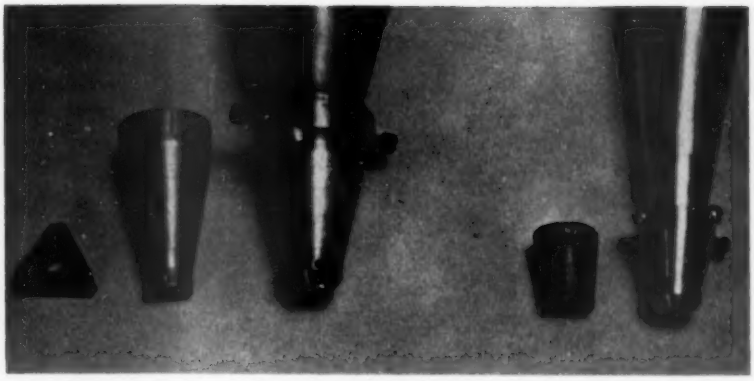
"Now I wanta the other one," Tony demanded. He finally settled for cash.

It was several weeks before anybody wised Ket up to the fact that Tony had used low-hydrogen electrodes. They'll work every time as long as the cast iron is fairly decent metal and not too dirty.

* * *

Thanks, and a tip of the old helmet to K. V. Lutz, White Plains, N.Y.

HOPPER fitted with an adapter tip



TWO types of adapter tips installed. Original tip is at left of each hopper

Welding with Magnetic Flux*

BY R. A. HAND
Automatic Welding Specialist, Stoody Co., Whittier, Calif.

A SIMPLE nozzle adapter for the conventional semiautomatic or "squirt" welder gives promise of new and higher deposition speeds. The device is said to make possible the deposit of various alloys at speeds that are not only higher than can be obtained by ordinary manual welding but even exceed the deposition rate achieved by the full automatic welding head.

In essence, the new process utilizes the magnetic field created by the passage of the electric current through the bare electrode. The electrode attracts a magnetic flux*, which coats the wire immediately ahead of the welding arc. The operating cycle is completed by the use of permanent magnets in the nozzle adapter, which act as a dam to the flow of flux whenever the arc is broken.

Two Methods Combined

The whole process is merely a combination of two accepted and proved welding methods—the squirt welder, which uses a granular nonmagnetic flux to produce the common submerged-arc deposit, and the magnetic-flux method of automatic welding, as perfected by Brown Boveri in Switzerland some years ago. The squirt welder, employing the hidden arc beneath a simple flux, is in everyday use and is familiar to all those interested in welding.

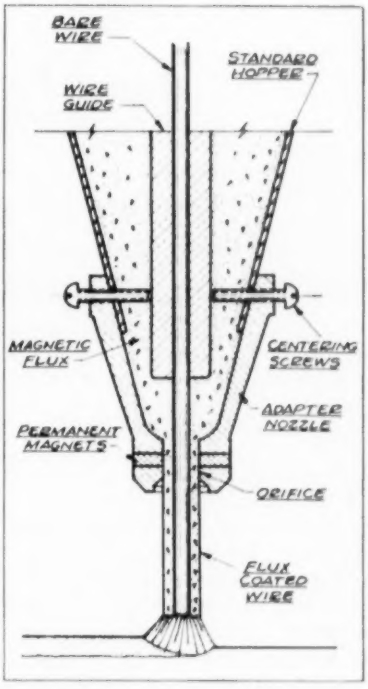
Flux Sticks to Wire

The Brown Boveri method is less widely recognized. Basically, it depends upon use of a granular flux of a magnetic metal. In this machine, the flux in the standard hopper is fed by gravity to a cup around the contact jaws. Establishment of the arc creates magnetic lines of force, which cause the flux to adhere to the wire. Thus there is produced what is to all intents and purposes a coated electrode. The amount of flux applied to the wire is governed by the size of the orifice in the cup. An electromagnetic coil in the cup acts as a dam when welding is interrupted. This general process was covered by European patents some eight years ago and has been used since then for mild-steel fabrication much as the submerged-arc process has been employed.

Some time ago my company became interested in magnetic flux as a possible method of applying alloy materials through semiautomatic welders. The wires used with these welders are limited to small diameters —generally 5/64 in. and 3/32 in. —sizes too small to be fabricated into tubular wires for application through the full automatic head. The Brown Boveri method was adapted to the squirt welder and tested over a considerable period. It appears to offer numerous advantages over both manual and semiautomatic welding.

As applied to build-up and hardfacing, the magnetic process provides much higher deposition rates (8 to 20 lb of deposited metal per hour, using 5/64 in. or 3/32 in. wires); the deposition rate will depend upon amperage. Deposits are sound and have the consistency and uniformity characteristic of automatic welding. Time lost in changing electrodes is eliminated, and there is, of course, no stub-end loss. There is no need for maintaining large stocks of vari-

(Continued on page 84)



CROSS-section through nozzle of adapter shows how it works

*To avoid confusion, it should be noted that the word "flux" is here used in its ordinary welding meaning. The term "magnetic flux" does not refer to magnetic induction but to a substance used to promote fusion, this particular substance being made of a magnetic alloy.

Aluminum Co. of America

GAS A large torch preheats the seam on this heavy-walled vessel. Preheat temperature should be checked before welding

Aluminum Co. of America

ARC Brackets are being metal-arc welded to an aluminum tank

6 Processes for Fusion

Here they are—count 'em: (1) oxyacetylene, (2) metal-arc, (3) carbon-arc, (4) atomic-hydrogen, (5) tungsten inert-gas and (6) metal inert-gas. This article contains useful information to help you select the right welding process for your particular job.

BY LESTER F. SPENCER

THE successful fusion welding of aluminum and its alloys is contingent upon a knowledge of three important characteristics. These are: (*a*) low-melting temperature; (*b*) oxide film on sheet surface; (*c*) "hot shortness" at high temperatures. Let us consider each of these in detail.

(*a*) In comparison to the melting temperatures realized in the welding of the ferrous materials, the melting temperature of the aluminum-base alloys is low. Pure aluminum melts at 1,280 F, while various alloy combinations will melt at slightly lower temperatures. Furthermore, steels provide a series of color changes to show when the melting point is at hand. Aluminum alloys give no physical indication.

(*b*) Aluminum-base alloys have a very tough, corrosion-resistant film of aluminum oxide on the surface. This film must be removed prior to actual fusion, and precautions must be taken to inhibit its re-formation during actual welding. Sound welds cannot be obtained unless the oxide film has been removed. With any type of joint in aluminum, and any fusion-welding method, the importance of cleaning the weld area thoroughly cannot be overemphasized. First, a solvent must be used for the removal of such contaminants as grease and oil. Second, the thin oxide film must be removed from the weld area. This is accomplished by either chemical cleaning methods or by scrubbing with a stiff wire brush.

(*c*) Strength of the aluminum-base alloys falls rapidly as the temperature increases, a characteristic known as "hot shortness." This means that the members to be welded must be adequately supported. If they are not, distortion, buckling or even breakage may occur during welding.

Non-Heat-Treatable Alloys

The aluminum-base alloys can be divided into two general categories: (1) the non-heat-treatable alloys, which include alloys 2S, 3S and 52S, and (2) the heat-treatable grades, which include 53S and 61S.

Alloys 2S and 3S are quite commonly employed for aluminum weldments. Choice of alloy depends upon what mechanical properties are desired. The mechanical properties of 3S, in identical tempers, are approximately 20% higher than those of 2S. The weldability of each alloy is very similar. The non-heat-treatable aluminum alloys can be work hardened to various tempers.

When exceptional high strength values are wanted, alloy 52S may be used. This is a magnesium-chromium-aluminum alloy having strength values approximately twice those exhibited by alloy 3S. Alloy 52S is a bit more difficult to fusion weld because cracking near the weld joint may occur. It has been recommended [1,2,3] that butt or edge welds be made rather than either a lap or fillet weld.

If you are going to weld an alloy within the non-heat-treatable group having a cold-worked temper, remember this: *fusion welding will destroy the mechanical properties realized through cold working.* This fact is of considerable importance to the designer. His strength calculations of welded joints must not be based upon

Linde Air Products Co.

TIG **Tungsten inert-gas arc welding process is widely used to fabricate thin-walled aluminum products like this duct**

Air Reduction Sales Co.

MIG **Manhole is fillet welded to a large tank by metal inert-gas**

Welding of Aluminum

the higher mechanical properties as given by the cold-worked temper.

Heat-Treatable Alloys

The alloys classified as "heat-treatable" grades are generally more difficult to fusion weld than the alloys previously mentioned. Welding will tend to destroy the effects of the heat treatment. Because the rate of cooling from the welding heat is usually fairly rapid, however, the strength of the weld area is usually intermediate between that of a fully annealed alloy and the strength resulting from a solution heat treatment. In many instances, welding can be perfomed on a soft alloy composition, which is then subsequently heat treated to develop the higher mechanical properties.

The magnesium-silicon-aluminum alloys 53S and R353 have good weldability. However, a fusion-welding procedure is not usually recommended[2] where the full strength of the joint is desired. Alloy 61S has a very similar weldability to that exhibited by alloy 53S, and it has slightly higher strength values.

Alloys such as 17S and 24S, which contain appreciable amounts of copper within the base analysis, are also difficult to fusion weld. A fusion-welded joint is not only considerably reduced in strength but also likely to be embrittled adjacent to the weld. Corrosion resistance may also be seriously impaired. Whenever possible, these alloy types are resistance welded. Clad alloys may be exemplified by "Alclad" 24S, which has a core of 24S alloy and a thin coating of high-purity aluminum. Fusion welding of this alloy will lower its corrosion resistance because of the diffusion between the core and clad material.

The weldability of the aluminum-base alloys also depends upon the product type. The wrought alloys—sheet, tubing, rolled and extruded shapes—can easily be welded. Castings from sand or permanent molds can be welded to each other or to wrought parts. Difficulties will be encountered, however, in making a repair of a defective die casting, whether the procedure chosen be a fusion or a resistance welding method.

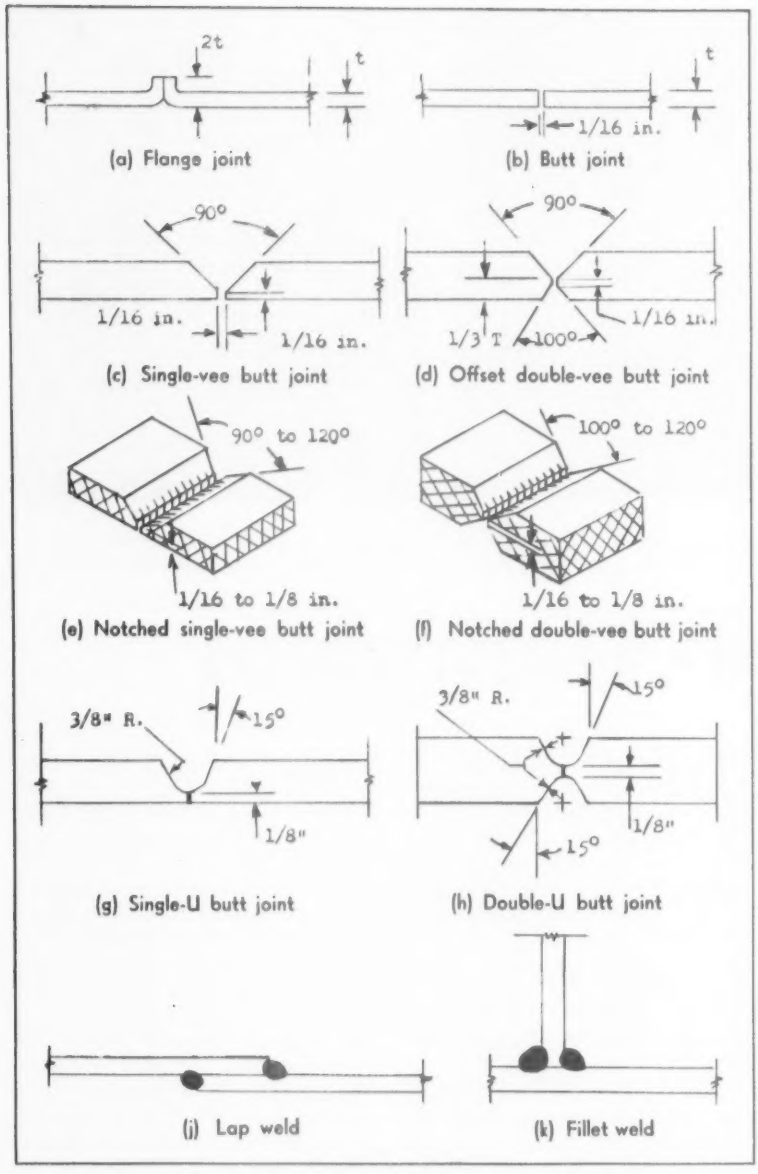
Joint Designs

The selection of a specific joint design is governed by three factors; namely, (1) the load and its characteristics; (2) the method in the application of this load; (3) the cost involved in both joint preparation and in actual welding.

The flange-type joint, Fig. 1a, can be used in the welding of thin-gage material. As is indicated, the flange height should be approximately equal to the thickness of sheet that is welded. A simple butt joint, similar to that indicated in Fig. 1b, can also be employed with thin material. The only requirement for this joint design is that the edges be straight and square. The square butt joint is employed for all types of welding up to a maximum thickness of ⅛ in. where welding is to be done from only one side. In metal-arc welding, the simple butt joint can be used in plate thicknesses up to ¼ in.

A deviation from the butt joint employed in the welding of steel is to notch the length of the abutting faces. It is suggested that the notches be approximately 1/16 in. deep and be spaced approximately 3/16 in. along the length of the joint. The notch butt joint not only aids in obtaining full penetration but will also permit a fluxing agent (as employed in gas welding) to work down through the full thickness of the sheet. There is less chance in melting holes through the sheet[5] when the notch preparation is employed. In addition, the notches will serve as small expansion joints to prevent local distortion.

The single-vee butt joint, Fig. 1c,



1–TEN types of joint designs that you can use to weld aluminum alloys

is used in all types of fusion welding, the thickness varying with the method chosen. In metal-arc welding, a range from ¼ in. and up can be employed; in inert-gas welding, the thickness range is from ⅛ to 1 in.; in oxyacetylene, atomic-hydrogen and carbon arc welding, a thickness range varying from 3/16 to ⅜ in. is recommended[3].

Though the vee-type of butt joint offers the advantage of greater penetration, it must not be forgotten that its preparation is more costly and more electrode metal is used than with the square butt joint.

The double-vee butt, Fig. 1d, is usually used for heavier plate thicknesses and for joints where welding is done on both sides. The "offset" joint shown in Fig. 1d is particularly suggested[3] for gas, atomic-hydrogen and carbon-arc welding of plate varying in thickness from ⅜ to 1 in. It can also be employed for metal-arc welding of plate from ½ in. upwards. Here, again, the dimensions given will depend to some extent on the actual plate thickness to be welded.

The cost of double-vee joint preparation is higher than that of the single-vee joint; however, only about one-half as much electrode metal will be consumed.

With both single-vee and double-vee butt joints, the use of the notching system will be of benefit (Figs. 1e and 1f). The single-U and double-U joints, Figs. 1g and 1h respectively, are recommended[3] for the inert-gas welding of heavier gages. The thickness limitation on the single-U joint is from ½ in. and over; the limitation on the double U-joint is approximately ¾ in. and over.

The lap joint, Fig. 1j, is not recommended for a number of the aluminum alloys. When this joint design is employed, however, a double lap weld is suggested.

The square T-joint or fillet weld in Fig. 1k is likewise of limited use. When this joint design is employed, a double fillet is preferred to a single fillet. Joint preparation is negligible; however, the square T requires considerable weld metal and so welding costs may be higher than with other types of T-joints.

The single-bevel and double-bevel T-joints (not illustrated) are similar to the square T except that the vertical member has a bevel of the type indicated. The single-bevel joint is employed for the joining of plate thicknesses up to approximately ½ in. that can be welded on only one side. The double-bevel joint is used for heavy plate where welding on both sides is permissible.

As with the other beveled joints under discussion, the electrode costs decrease as one progresses from the plain T to the single-bevel T and finally to the double-bevel T.

1—Gas Welding

Gas welding of aluminum may be done with either the oxyacetylene or the oxyhydrogen flame but is usually confined to stock not under 1/32 in. thick. Thinner sheets than 1/32 in. are better welded by a resistance method.

The use of jigs to support the parts adequately is usually mandatory in aluminum-welding procedures, especially with the thinner gages. A jig serves quite well in maintaining the alignment of abutting edges during welding and will aid considerably in minimizing distortion and buckling.

The jigging employed in the joining of the heat-treatable alloys need not be as rigid as in the welding of the non-heat-treatable grades. One method recommended[3] is to use tack welds while the component parts are in the jig and then loosen the jig

clamps before completing the seam. Clamping is usually done at a distance from the joint; this distance may be from 6 in. upward.

Tack welds prior to final welding will also aid in minimizing distortion and preserving alignment. The spacing of the tacks should depend upon the gage being welded. On sheet thicknesses up to approximately 1/16 in., the spacing should be from 1 to 2 in. This spacing can be increased proportionately up to about 10 in. on material ½ in. or heavier in thickness.

Distortion and buckling can also be controlled to some extent by the judicial location of joints within the assembly. Thus minimum distortion can be obtained with edge or corner welds[3] and in assemblies where the weld bead can be located on a crown or radius. The location of welded seams or fittings in flat areas should be avoided.

Preheat Temperatures

Good practice usually dictates a preheat; preheating reduces both thermal strains and the amount of welding gas that is required for the actual melting of the seam. In the gas welding of a plate ⅜ in. thick, the preheat temperature should be between 500 and 700 F. The usual method employed is to use a secondary torch, which heats locally the seam that is to be welded. It is important that the preheat temperature does not exceed an upper limit of approximately 800 F[3]. If furnace preheating is employed, a pyrometer should be used to control the temperature. Where pyrometric control is not possible, the preheat temperature may be judged by one of the following methods[3]:

At the proper temperature for welding, a pine stick rubbed on a casting will leave a char mark on it.

Chalk marks with carpenter's blue chalk will turn white at the proper temperatures for welding.

Cold aluminum gives a metallic sound when struck. This sound becomes duller as the temperature rises. At the temperature required for welding, there is no longer a metallic ring.

Temperature-indicating sticks or pellets, which melt sharply at a given temperature, can be used.

Standard torches, hoses and regulators are suitable for welding aluminum. The ability to select the proper torch in relation to the gage to be welded is acquired mainly through experience. The values given in Table I can serve as a rough guide for the selection of tip orifices and oxygen and fuel-gas pressures. However, tip size will vary in accordance with the design of the weld joint, the location of the weld joint, the thickness of material to be joined and the experience of the operator. Obviously, the more experienced man will be able to use a larger tip than a relatively inexperienced worker.

Table I. Tip Sizes, Gas Pressures and Filler Rods[3]

Thickness, B & S gage	OXYHYDROGEN			OXYACETYLENE			Filler rod, diam, in.
	Diam of tip orifice, in.	Oxygen pressure, psi	Hydrogen pressure, psi	Diam of tip orifice, in.	Oxygen pressure, psi	Acetylene pressure, psi	
24–22	0.035	1	1	0.025	1	1	3/32
20–18	0.045	1	1	0.035	1	1	3/32
16–14	0.065	2	1	0.045	2	2	3/32
12–10	0.075	2	1	0.055	3	3	1/8
1/8–3/16	0.095	3	2	0.065	4	4	1/8, 5/32
1/4	0.105	4	2	0.075	5	5	3/16
5/16	0.115	4	2	0.085	5	5	3/16
3/8	0.125	5	3	0.095	6	6	3/16 or 1/4
5/8	0.150	8	6	0.105	7	7	3/16 or 1/4

Table II. Metal-Arc Welding Data for Various Joints[1]

Joint	Beads or passes	Electrode diameter, inches	Current, amperes	Minimum arc voltage	Arc speed, ipm	Lb of electrode per foot of weld
Butt joint						
18 gage	1	3/32	40	20	22	0.011
14 gage	1	1/8	65	20	22	0.0195
1/8-in. plate	1	5/32	120	20	16	0.0537
3/16-in. plate	1	3/16	170	20	12	0.100
3/16-in. plate	1	3/16	170	20	17	0.070
	2	3/16	170	20	17	0.070
						0.140
1/4-in. plate	1	3/16	170	20	14	0.086
	2	3/16	170	20	14	0.086
						0.172
3/8-in. plate	1	1/4	250	20	12	0.140
	2	1/4	250	20	12	0.140
						0.280
Single-vee butt						
1/4-in. plate	1	1/4	250	20	12	0.140
Lap weld						
14 gage	1	1/8	65	20	13	0.033
1/8-in. plate	1	5/32	120	20	16	0.0537
3/16-in. plate	1	3/16	170	20	14	0.086
1/4-in. plate	1	1/4	250	20	14	0.140
Single fillet weld						
1/8-in. plate	1	5/32	120	20	12	0.0175
3/16-in. plate	1	3/16	170	20	10	0.120
1/4-in. plate	1	3/16	170	20	9	0.133
Edge weld (two abutting surfaces)						
18 gage	1	3/32	40	20	28	0.0086
14 gage	1	1/8	65	20	24	0.0178
1/8-in. plate	1	5/32	120	20	22	0.039
3/16-in. plate	1*	3/16	170	20	16	0.075
1/4-in. plate	1*	1/4	250	20	16	0.11
Corner weld						
1/16-in. plate	1	1/8	65	20	24	0.0178
1/8-in. plate	1	5/32	120	20	22	0.039
3/16-in. plate	1	3/16	170	20	20	0.060
1/4-in. plate	1	1/4	250	20	20	0.070

* Weave this bead

Aluminum Co. of America

TWO ways to repair aluminum castings. This picture shows older welding method of the oxyacetylene torch

Linde Air Products Co.

TIG (tungsten inert-gas) welding is being used at large aluminum foundry to correct imperfect castings

The choice of the oxyacetylene or oxyhydrogen flame is usually governed by the thickness of material. The range usually placed upon the oxyhydrogen flame[7] is from 1/32 to 3/8 in.; in many instances, however, the upper limit is put at 3/16 in. For metal thickness above this upper limit, the oxyacetylene flame is employed because of its higher heat capacity.

Regardless of the gas combination, a neutral or slightly reducing flame is recommended; this gives the best speed and economy as well as a clean, sound weld.

Gas Filler Rods

For the gas welding of both 2S and 3S alloys, a filler rod equivalent in composition to alloy 2S is generally used. In the welding of all other types of aluminum alloys mentioned, an aluminum-silicon rod containing approximately 5.0% silicon is preferred. This rod has a substantially lower melting point than pure aluminum and a freedom from hot shortness, which will reduce the difficulty of thermal cracking.

Welding rod size will vary with the thickness of stock to be welded; rod diameters are suggested in Table I.

To protect the joint during gas welding, a suitable flux is painted on the surface to be welded and also applied to the welding rod. This flux retards oxidation products from forming on the surface of the aluminum; it actually dissolves the oxides as they form. Since the fluxing agent is quite corrosive, it is essential that the item be cleaned of excess flux directly after welding.

With non-heat-treatable alloys (53S, 61S or 63S) a single-pass weld is the preferred technique. The hammering of a weld bead flush, though often practiced with the non-heat-treatable alloys, is generally not recommended because the higher rate of work hardening may lead to subsequent failure. It is more desirable to chip excess weld bead close to the plate surface, after which light hammering can be done to dress the weld.

Table III. Operating Data for Tungsten Inert-Gas Welding[8]

Thickness, inches	Current range, amperes	Argon flow, cfh	Rod size, inches	Arc speed, ipm
0.025	10–75	8–12	1/16	3–50
0.031	10–90	8–12	1/16	3–50
0.0375	20–100	8–12	1/16	3–50
0.050	50–200	10–14	3/32	5–15
0.0625	70–200	10–14	3/32	5–15
0.0781	80–250	10–14	1/8	5–40
0.109	200–300	12–16	1/8	5–30
0.125	200–400	12–16	3/16	10–30
0.195	250–400	12–16	3/16	10–30
0.250	250–500	14–20	3/16	6–16
0.375	350–450	14–25	1/4	5–10*
0.500	400–500	20–30	1/4	5–10**

* Two passes ** Three passes

Aluminum Castings

In general, the gas welding of cast aluminum alloys is very similar to the technique employed in welding wrought products. Intricate designs and varying cross-sections within the castings may create difficulties such as weld cracking; preheating, usually by means of a furnace, is then essential in order to minimize thermal stresses within the structure. Torch preheating may be used with small castings or in the event that relatively thin sections of large castings are to be repaired. In the repair of a cracked casting, an added precaution[2] is the drilling of a hole in the end of the crack to prevent it from spreading.

Both jigs and tack welds are recommended whenever possible in the welding of aluminum castings. Also, the fluxing agent should be applied copiously. Proper torch manipulation is of importance in the welding of thin sections to heavier sections so as to obtain the right distribution of heat. A puddling rod made from steel and shaped in the form of an arrow at one end can be of help in preventing too early melting within the thinner sections.

In the welding of the non-heat-treatable castings, either 43 or 108 welding rod can be used. Where the castings will require a subsequent heat treatment to obtain desired mechanical properties, a welding rod similar to the composition of the casting should be employed. In large

Half mile of HELIARC TRADE MARK welds OK'D by rigid X-ray tests

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LEFT Welding heavy aluminum sections with HELIARC *HW-10 torch. These welds were strong, dense, and required little finishing. BELOW The 300 amp.* HELIARC *torch has all-internal water-cooling of both torch head and power cable for cool, long-lasting operation. The HW-10 also features quick electrode adjustment.*

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castings in which the repair areas are quite large, molten aluminum alloy is poured directly into the prepared grooves; this procedure minimizes both porosity and oxide formations. The casting is fluxed, preheated and maintained at the proper temperature by means of a torch, after which the molten metal is poured and puddled.

2—Metal-Arc Welding

In metal-arc welding, the previously discussed 5% silicon-alloy rod is employed as an electrode. Weld protection, however, is obtained from the heavy coating on the rod rather than by the use of a flux. The high melting rate of most of the aluminum electrodes necessitates rapid welding, which will prevent excessive expansion and lessen distortion in the parts being joined. Because of the difficulty of controlling an arc at low currents, the minimum thickness of metal-arc welding is approximately 0.094 in. However, joints have been made in plates up to 2 in. thick by utilizing both preheating and a multipass technique.

Most arc-welded joints are equal to gas-welded joints in regard to strength. It is difficult, however, to obtain a liquid-tight or a gas-tight arc-welded joint[3] in material under ¼ in. thick.

Welding data are given in Table II for various types of joints and sheet and plate thicknesses.

Reverse polarity d-c is usually recommended. The arc should be so short that the electrode coating almost touches the molten pool of metal, and the electrode is held perpendicular to the work at all times. In addition, the arc should be directed so that both edges are properly and uniformly heated. In the event that a new electrode is required in the holder, it is advisable[1] to remove the slag from the crater of the weld and also from an area approximately an inch back of the crater. The arc is struck in the crater, then moved quickly back along the completed weld for half an inch. After the crater has been completely remelted, the welding again proceeds forward.

Arc welding can be performed in any position. Naturally, the vertical and overhead positions are the most difficult. Welding in a vertical plane may be accomplished either in a downward or an upward direction; either a straightline or a weaving motion may be employed in advancing the arc. Horizontal fillet welds are best made by positioning the work to weld about 20 deg downhill.

Welding in the overhead position is quite difficult and should be avoided. If this welding position is necessary, however, the welding should be done with a number of straight beads. Lap and fillet welds can be produced, with the recommended angle[1] between the electrode and the horizontal plate approximately 45 deg.

Jigs are usually required in the welding of relatively thin-gage material, and copper back-up plates can be used to advantage. When plates ⅛ in. or heavier are being butt welded, it is suggested that the copper back-up plate be slightly grooved and that the grooved section be directly beneath the joint to be welded. Butt joints in plates 3/16 in. and heavier should be done with two beads; usually, no backing nor clamping is required.[1]

In both lap and fillet welds, a small rotary motion of the electrode is suggested; the arc should be progressively positioned from one member to the other member of the joint.

In the welding of heavier plate than the upper limit of ⅜ in. given in Table II, the values listed will increase. A thickness of ½ in., for instance, will require a three-pass technique on either butt, lap or fillet welds with a current of approximately 300 amp. In the welding of a 2-in. plate, an eight-pass procedure is required for butt welding with approximately 550 amp of current and an electrode ⅜ in. in diameter.

Metal-arc welding of the heavier gages of aluminum usually requires a preheat; the preheat temperature may vary from 250 to 400 F. Tack welding is also employed, the spacing (as in gas welding) being determined by the gage to be welded.

3—Carbon-Arc Welding

The carbon arc produces a sound weld comparable to torch welds in aluminum, with the added advantage the welds can be made with considerably less distortion. The manual method of carbon-arc welding is usually limited to a maximum thickness of ⅜ in. Joint preparation is very similar to that for gas welding except that notched or beveled joints are not required in thicknesses under ⅛ in. Use of a back-up strip, as in metal-arc welding, is recommended.

The carbon electrode is ordinarily the negative pole. The filler metal, a flux-coated rod, is fed into the arc flame in the same manner as the welding rod in torch welding. A rod with a lighter coating of flux than a metal-arc electrode is recommended[2] in order to obtain both better weld appearance and faster speeds. The current settings and electrode sizes given for metal-arc welding usually apply.

Automatic carbon-arc equipment is especially suited to relatively long seams in heavy-gage material. No edge preparation is required other than obtaining an accurate alignment of abutting edges; this alignment is maintained by the use of either clamps or by metal-arc tacking. A back-up bar, either of copper or stainless steel and ¼ in. or more in thickness, can be used advantageously. The bar should be provided with a groove approximately 1/16 in. deep and ⅜ in. wide, which is placed directly below the joint. This arrangement will provide space for a penetration bead and slag. A bare wire is automatically fed into the joint; to give protection, the fluxing agent, in powdered form, is fed automatically just ahead of the filler rod.

4—Atomic-Hydrogen

Atomic-hydrogen welding may also be done either manually or automatically. In this method of welding, an a-c arc is maintained between two tungsten electrodes in an atmosphere of hydrogen gas. The arc torch is used very similarly to a gas torch, but its rate of travel is much faster. A filler rod (previously fluxed as in gas welding) is fed to the hydrogen-protected arc.

The high rate of heat transfer experienced in atomic-hydrogen welding will reduce both distortion and the width of the heat-affected zone as compared to gas welding. A low flux consumption is realized because of the hydrogen envelope of protective gas around the joint during welding.

5—Tig Welding

The acceptance of inert-gas shielded procedures for welding aluminum and other metals has been remarkable. There are two chief types of inert-gas welding: Tig welding, in which the arc is maintained between the work and a tungsten electrode, and Mig welding, in which the

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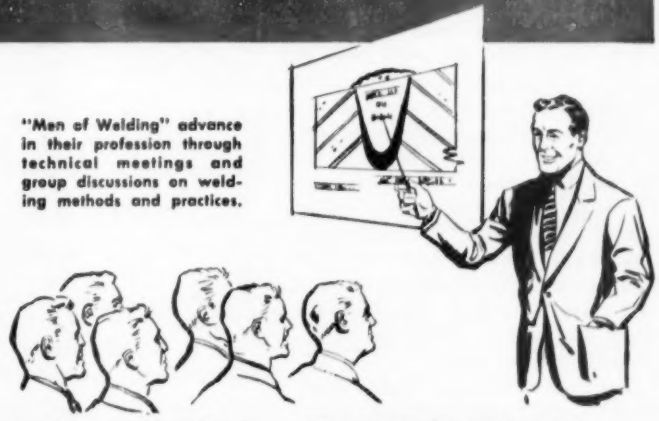

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arc is between the work and a bare metal electrode wire of the same or similar composition. The protective atmosphere—usually argon in the welding of aluminum-base alloys—precludes the need of a fluxing agent applied from an external source. This permits greater latitude in joint designs since there is no danger of corrosive flux being entrapped, no matter what the joint design may be.

General operating data for Tig welding, including current ranges, argon flows, rod sizes and arc speeds, are given in Table III. A filler rod may or may not be used. When filler rod is employed, the method of feeding wire is usually from 20 to 30 deg from the horizontal. The wire is fed in short jabs into the very front edge of the pool, drawing the arc back along the weld, if necessary, to prevent the arc from playing on the end of the filler wire. About 1/16 in. of filler wire is melted off with each jab, and then the filler wire is withdrawn about ½ in. out of the hot welding zone.

Never add filler wire continuously since the resultant heat travel up the wire will oxidize that portion of the wire not covered by the argon atmosphere. In addition, the area of base metal directly under the wire may not be adequately protected by the inert gas. Also, avoid addition of filler metal until the weld pool is bright[3] and has progressed sufficiently ahead of the tungsten electrode to permit the wire to be added without the danger of inserting it in the arc stream. The surface of the weld bead should be bright, with smooth, evenly spaced convolutions. The penetration side should be light gray in color and should not show a center crevice; this latter condition may indicate either insufficient welding heat or improperly cleaned edges.

Tig welding is being used successfully for the repair of heavy aluminum castings by at least one large aluminum foundry. Usually, the only preparation required is grinding, although the area to be welded may be preheated if it is particularly large.

6—Mig Welding

Metal inert-gas welding employs a welding gun that feeds the electrode wire automatically as fast as it is consumed in the arc. Diameters of the electrode wire that is used for Mig aluminum welding range from 1/32 in. up to 5/16-in. for 1-in. and 2-in. plate. Ordinarily, a heavy current is carried on a relatively small wire, resulting in high current densities. This means a high deposition rate, high welding speed and a comparatively short time in which the joint is exposed to welding heat. For these reasons, Mig welding is very well suited to mechanized production or to such applications as the fabrication of large aluminum tanks where long seams must be welded in comparatively thick material.

Some typical examples of Mig welding are taken from recent issues of THE WELDING ENGINEER. For pressure vessels of 2S aluminum with ⅜-in. wall thickness, a 1/16-in. aluminum wire was used with an argon flow of 40 cfh. Current was 375 amp d-c reverse polarity.[10]

Other 2S aluminum tanks of ⅜-in. plate were welded with a 1/16-in. 2S electrode wire and a shielding gas mixture of 80% helium-20% argon. Current was 210 amp, reverse polarity d-c. On the same job, structural elements composed of 61S-T6 aluminum were welded with a 1/16-in. 43S wire.[11]

Aluminum dump truck bodies were welded of 61S-T6 aluminum, ⅛-in. and 3/16-in. plates and 3/16-in. angles and channels. Shielding gas was helium, flowing at a rate of 60 cfh. The welding was done with 1/16-in. and 3/64-in. wire. Settings for the 1/16-in. wire were: 180 amp at a speed of 210 ipm; 150 amp at 190 ipm. For the 3/64-in. wire, the setting was: 100 amp at 250 ipm.[12]

SEVEN POINTS TO REMEMBER

In summing up the various factors involved in the welding of the aluminum alloys, the most important considerations are.

(1) It is necessary to preheat either wrought or cast aluminum products, especially where heavy gages are encountered or where there is a difference in cross-sectional areas. Temperature control is essential.

(2) Cleanliness of the joint and the removal of the oxide film prior to welding cannot be overemphasized. Almost equally important is the cleaning procedure after welding where corrosive flux materials have been employed.

(3) In the welding of cast products, the oxacetylene method is the most frequently used procedure. Both metal-arc and carbon-arc procedures are also employed. The carbon-arc method produces welds freer of oxides and porosity, but metal-arc welding is faster and more flexible. Tungsten inert-gas welding has been used in at least one instance.

(4) Both distortion and weld cracking are minimized when the faster methods of welding are employed. These include metal-arc welding and metal inert-gas (Mig) arc welding.

(5) The advantages obtained by the inert-gas welding methods are enormous. To cite only one, wider latitude is permissible in joint design because there is no need to guard against flux entrapment.

(6) The characteristics of the material available should be known prior to the selection for a specific job. This knowledge will aid considerably in designing the joint and in observance of the precautions required during welding.

(7) Adequate ventilation and protection for the weldor should be provided.

Coming in March!

NEXT MONTH: we will carry another of Mr. Spencer's factual articles on the welding of the different materials. This one deals with none other than the familiar plain-carbon steels. Think you know all about arc welding the carbon steels, do you? You may be surprised when you read Mr. Spencer's jammed-full-of-meat article.—*Editors.*

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[10] *X-Ray Welds for Aluminum Tanks.* Jerome Hertel, THE WELDING ENGINEER, April, 1953.

[11] *Welding—Inside and Out.* Paul A. Rodecki, THE WELDING ENGINEER, August, 1952.

[12] *Welded Aluminum Dump Truck Bodies.* THE WELDING ENGINEER, April, 1952.

Remember — the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.

Engineered FOR ENDURANCE

THIS TUBE-TURN WELDING TEE is drawn from seamless tubing to a barrel shape—the form every tee wants to assume under pressure. This design, plus the generous crotch radius and thickness, assure exceptional strength and endurance. In tests of representative fittings, bursting pressures have averaged over 25% higher than required by applicable standards.

This extra quality at no extra cost is typical of all TUBE-TURN Welding Fittings and Flanges. For satisfying service, and to fill all your requirements from one reliable source, get in touch with your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

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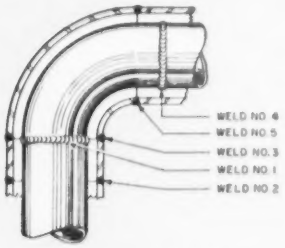
ENGINEERING SERVICE

TUBE TURNS' ENGINEERING SERVICE

develops new method of fabricating jacketed fittings

FABRICATION TIME AND COST can be reduced with this method of using welding fittings for directional changes in jacketed piping systems. The jacketed fitting combination consists of long and short radius TUBE-TURN Welding Elbows, with center-line radii closely matching. A tangent on one end of the inside elbow (see cut) extends beyond the corresponding end of the outside elbow. On the other end a short length of pipe is attached to simplify installation.

The method eliminates the need for steam and coolant jumpers, and also eliminates flanged joints, except where disassembly must be provided for. Insulation can be readily applied. Maintenance costs are sharply reduced, as all joints are permanently leakproof. The assembly provides optimum flow conditions, and minimized thermal problems.



Welding sequence for elbow of jacketed system.

This improved technique is another contribution to piping technology by TUBE TURNS' Engineering Service Division—always ready to help you with special piping problems.

TUBE TURNS, INC., Dept. N-2
224 East Broadway, Louisville 1, Kentucky

Please send me free copy of Pipe and Fitting Materials.

Company Name _____

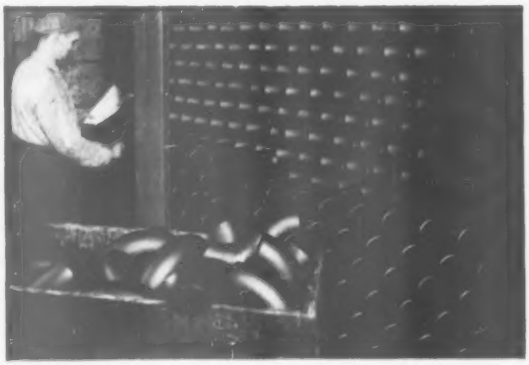
Company Address _____

City _____ *Zone* _____ *State* _____

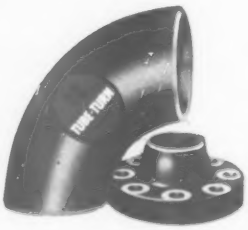
Your Name _____

Position _____

These water, steam, and air lines, using TUBE-TURN Welding Fittings to make directional changes, provide permanently leakproof service. Note compactness of layout, and how neatly insulation is applied.



SERVICE is the middle name of your nearby TUBE TURNS' Distributor. He can help you fill all your requirements from one reliable source. TUBE TURNS, INC. offers the world's broadest line of welding fittings and flanges, in a wide range of types, sizes, and more than 40 different alloys.



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"®" and "TUBE-TURN" Reg. U.S. Pat. Off.

TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

This feedwater extraction heater constantly developed leaks. That is, until it was repaired with 3/32-inch "140" Monel electrodes.

A welder beginning work on the tubing. Close-up view shows a section of the heater. The top rows are welded. The center section is machined, ready for welding. Lower sections are unmachined.

Headed for the Scrap Pile

...until "140" Monel headed it off

The Harbor Steam Plant of the City of Los Angeles, Department of Water and Power, had troubles.

One of the feedwater extraction heaters, which has a carbon steel tube sheet and 570 tubes of 70-30 copper-nickel, began to develop leaks between the tubes and the tube sheet almost as soon as it was installed.

It still leaked after a number of repair jobs. So it was decided to purchase a new heater.

But the superintendent and his engineers wouldn't admit defeat. They started searching for a way to beat the heater at its own game.

Here's how they finally won —

They spot machined the tube sheet outside of the tube with a special hollow-end mill which simultaneously skinned and cleaned the tubes. Then the tubes were machined to protrude about 1/16-inch to allow bonding depth. (This was important because of the difference in composition between the carbon steel tube sheet and the 70-30 copper-nickel tubes.)

After experimenting with numerous filler and welding materials they settled on 3/32 inch diameter "140" Monel® welding electrodes (one of many Inco Nickel Alloy electrodes especially developed for welding dissimilar metals).

And the "140" Monel electrode did the job! Within a few days, the heater was back in operation — as sound as new.

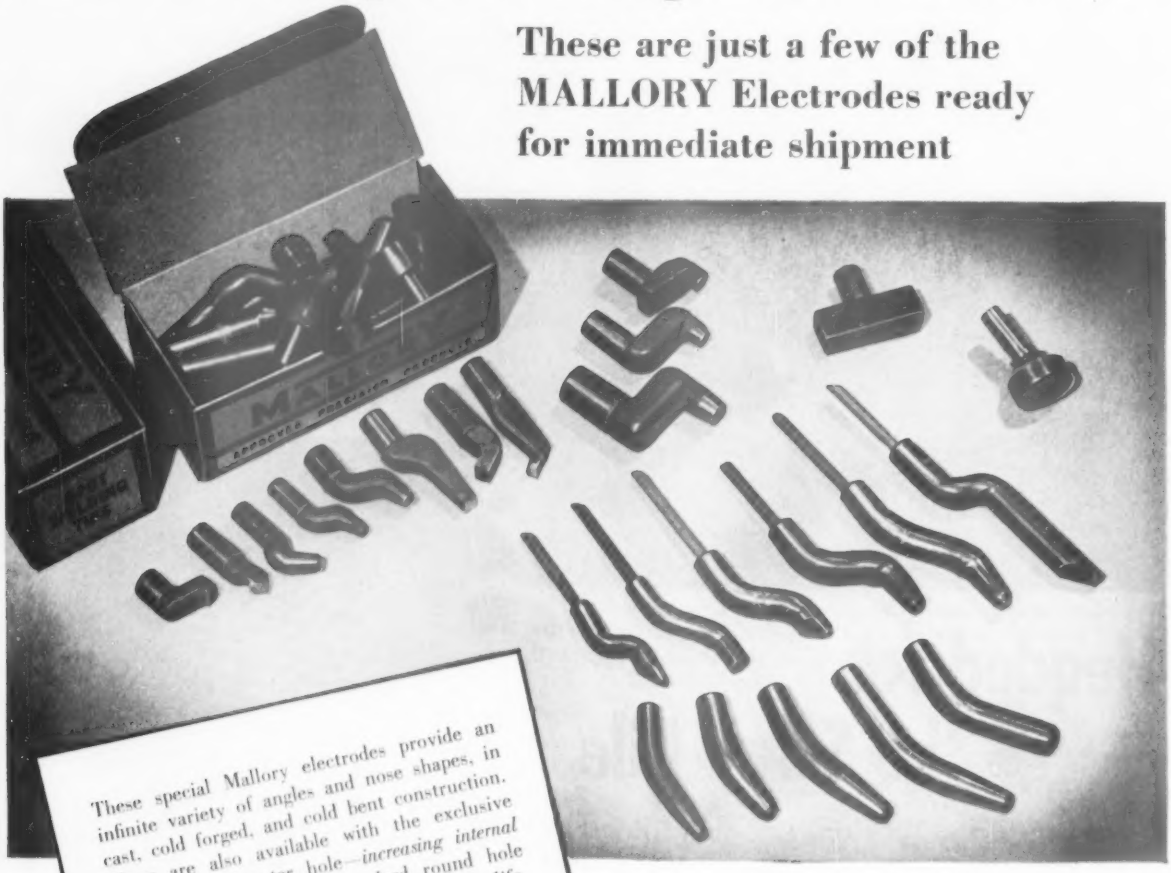
If you have a welding problem — whether it be on dissimilar metals or not — chances are Inco's welding engineers can recommend a welding electrode to do the job. Write them.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

Inco Nickel Alloys INCO

Pick Your Special Shape from Stock . . .

These are just a few of the MALLORY Electrodes ready for immediate shipment



These special Mallory electrodes provide an infinite variety of angles and nose shapes, in cast, cold forged, and cold bent construction. Many are also available with the exclusive Mallory *fluted* water hole—*increasing internal cooling area 70%* over standard round hole electrodes—and insuring longer electrode life.

Before going to the expense of having special electrodes made for a resistance welding job, check with Mallory. You will save both time and money and get a better job.

The electrodes illustrated are but a few of the hundreds of shapes that are stocked for immediate shipment . . . and a wide range of tools and fixtures equip us to make many more. Just send us a sketch of your requirements. We will do the rest.

When you turn to Mallory, you get the benefit of our 25 years of practical experience in developing special purpose alloys and specialized designs.

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Either call your distributor or write directly to us for a copy of our newest Resistance Welding catalog. It contains complete data on Mallory electrodes, holders, rods and bars, dies, castings, forgings and accessories.

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P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio.

Cubic Yards in a Conical Tank

BY W. F. SCHAPHORST

THIS chart will quickly give you the number of cubic yards in a conical tank (or conical roof of a cylindrical tank) when the diameter and the height are given in feet (see sketch).

For example, a conical tank has a base diameter of 100 ft and a height of 10 ft. How many cubic yards does it hold?

The dotted line drawn across the chart shows how it is used. For this example, you run the line through the 100 ft in the diameter, column A, and the 10 ft in the height, column C. The intersection with column B gives the answer—a little under 1,000 cubic yards.

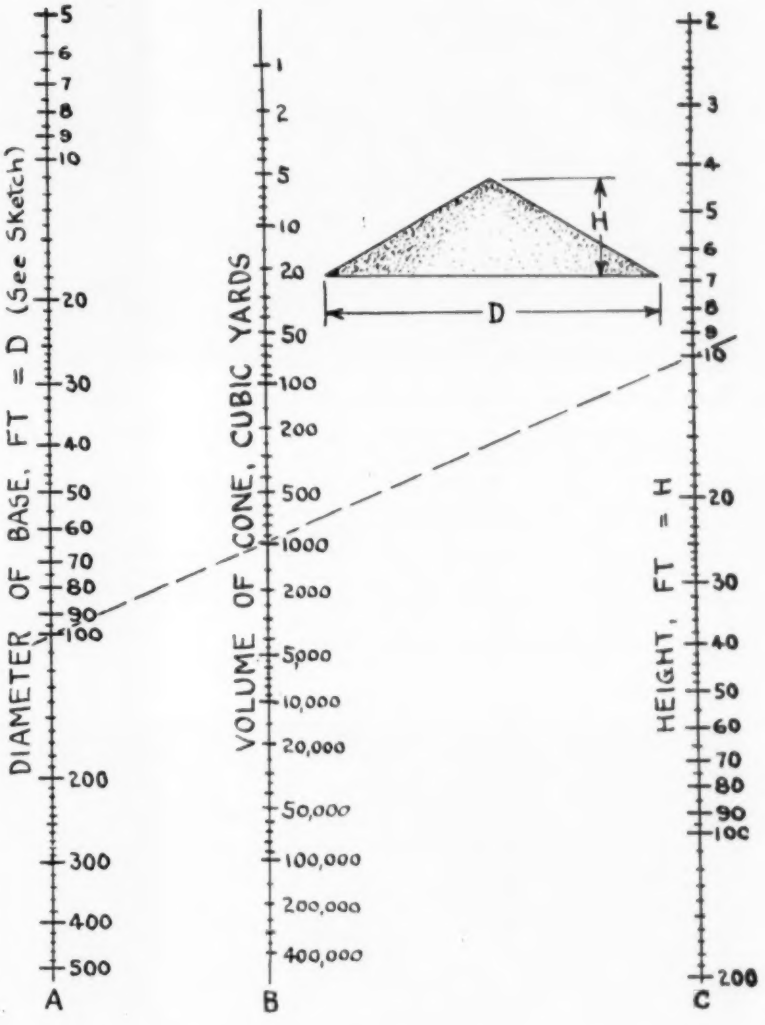
Checked with a four-place table of logarithms, the answer was found to be 969.7 cubic yards. The chart is accurate to within almost 3%.

The range of the chart takes care of diameters from 5 to 500 ft and heights from 2 to 200 ft. In the event that diameters or heights should be greater or less, the same chart is still applicable by changing decimal points. Thus if the diameter should be 1,000 ft and the height 100 ft, the same dotted line shown for 100 and 10 ft would solve the problem. However, the answer would be 1,000,000 cu yd instead of 1,000 cu yd.

The rule is this: For every cipher added to column A, add two ciphers to the answer in column B, and for every cipher added to column C, add one cipher to the answer in column B. Hence when the tank is 1,000 ft in diameter and 100 ft high (a truly colossal structure), three extra ciphers must be added to the result in column B.

Now suppose that the diameter of the tank is 1 ft and the height is 1 ft also. In this case, we will draw our line from 10 ft in column A to 10 ft in column C and read 10 cu yd at the intersection with column B. Proper manipulation of the decimal point brings this down to 0.01 cu yd, the correct answer.

The rule is: Move the decimal point two places to the left for each 1/10th reduction in column A and one place to the left for each 1/10th reduction in column C. Since we are making a 1/10th reduction in each column (in each case from 10 to 1 ft), the decimal point should be shifted three places to the left from the chart answer. This is equivalent to dividing 10 by 1,000 and gives you 0.01 cu yd, as before stated.



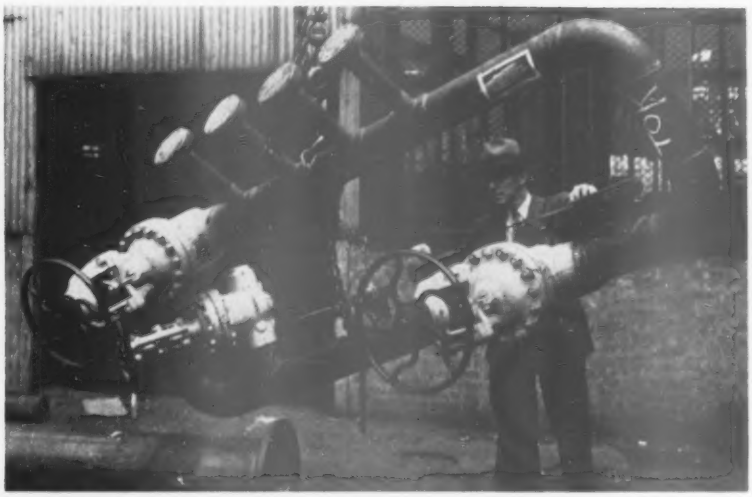
The formula for the volume of a right circular cone, in terms of its diameter, D, and height, H, is

$$V = 1/12\ \pi\ D^2H$$

When D and H are in feet, and it is desired to know V in cubic yards, a further arithmetical operation is required for conversion: the number of cubic feet must be multiplied by 0.03704 to get the answer in cubic yards. It is possible to combine the $1/12\ \pi$ and the 0.03704 into a single conversion constant. This turns out to be 0.009697. Then all the work you have to do is to multiply the diameter, in feet, by the height, in feet, by 0.009697 to get the volume of the cone in cubic yards.

For quick estimates, however, where the answer doesn't have to be too accurate, you can save a lot of time by using this calculating chart.

on the job . . .



Neat Loop Header for Boiler Feedwater

ABOVE picture shows a loop header recently fabricated in the Chicago shop of The Crane Co. It was made for boiler feedwater service in the Dyersburg Water & Light Plant, Dyersburg, Tenn. The loop proper was formed of 6-in. pipe and welding elbows of the same diameter; schedule 40, A-106 grade "A" seamless pipe was used. Welded to the header were six 3-in. and three 4-in. reinforced nozzles.

The header also contains two 6-in., 600-lb gate valves for sectionalizing flow. These had end fittings designed for welding. One of the 4-in. nozzles was similarly fitted with a 4-in., 600-lb gate valve. The 600-lb flanges are forged steel and of the welding neck type.

Courtesy Detroit Stamping Co.

Trunnion Fixture Speeds Tractor Frame Assembly

TOWING tractors for military airports were manufactured on a production basis at the Federal Motor Truck Division of the Federal Fawick Corp., Detroit, by using a trunnion-mounted fixture for the tractor frames. Turning the full 360 degrees, this fixture permitted easy access to any part of the frame.

Toggle clamps held the parts securely during the fabrication. Special holding blocks were welded to the adjusting bolt of each clamp to aid in gripping the channels forming the sides of the frame. The heavy channels, frame rails and welded brackets were lowered into place on the fixture via an overhead crane and quickly clamped into position for the welding operations.

* * *

Courtesy Stow Mfg. Co.

12 Times as Many

THE REMOVAL of scale and weld from potheads for Diesel engines was consuming too much time at the B & D Preheat Welding Co., Silver Spring, Md. A study was undertaken to find out why. The operators were using heavy portable electric tools, which were fatiguing to handle. A switch was made to flexible-shaft grinding, using a ½-hp machine equipped with a 2-in. grinding wheel and a 4-in. wire brush. Both grinding (picture above) and wire brushing are done at a speed of 3,450 rpm. The company management reports that their men can now do 12 times as many potheads in the same time.

* * *

Old Rails Salvaged

BY USING the oxyacetylene pressure-welding process, Jersey Central Lines was able to utilize partly worn rails removed from tracks no longer needed to build new supporting and storage tracks at its Allentown Yard. Here is how it was done:

First, the worn ends at the joints of the salvaged rails were sawed off. The trimmed lengths were then placed into alignment and heated at adjoining ends. Then the rails were brought together under pressure; the excess metal was removed with power grinders, and the resulting continuous rail was cut to 78-ft lengths, which is double the length of a standard 39-ft rail.

Advantage of the long rails: a 50% reduction in the number of joints. Since most wear and tear occurs at the rail joints, track maintenance costs have been correspondingly reduced. Furthermore, a better surface is provided for the cars rolling down by gravity from the hump to the classification tracks.

Preplacing SIL-BOND rings on typewriter return carriage bar

Jig set-up for induction brazing return bar at Royal

Result: Smooth, clean, strong joints — EVERYTIME!

See New Color, Sound Movie
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Every day Royal Typewriter in Hartford, Connecticut proves the value of *SIL-BOND* low temperature brazing alloys in major mass production operations such as the sequence illustrated here.

Royal uses 15 sizes of *SIL-BOND* rings for strong, smooth joints, requiring no additional refinishing or grinding, which can be plated directly after brazing.

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SIL-BOND COMES IN COILS, PREFORMED RINGS STRIP OR STRAIGHT LENGTHS — IT'S *CHEMICALLY* BETTER — *PHYSICALLY* BETTER —

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National Carbide Company

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SAF-T-CHEK VALVES

This exclusive MECO construction provides insurance against seat or diaphragm failure. Built-in, self-actuating SAF-T-CHEK valves prevent damage to equipment from careless handling.

BOLTED DIAPHRAGM NEVER PUCKERS

Absolutely uniform pressure and flexibility is secured by *bolting* special alloy diaphragm – instead of conventional screw fastening which puckers diaphragm fibres. Diaphragm should last the life of the regulator.

Close yoke between diaphragm and multi-seat block insures transmission and correction of tiniest pressure variations providing constant and uniform pressure.

Meco

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Letters should be addressed to: The Editor, THE WELDING ENGINEER, 520 N. Michigan Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if you request it.

How It Looks to a German

Dear Sir:

As I frequently have to translate articles from THE WELDING ENGINEER, I just read your September issue's editorial "What Were We Fighting for?"

Although I do not feel capable of answering this question, I should like to take the liberty of putting before you a European's (and German's) point of view regarding this subject.

If I were asked, the plain answer would no doubt be: "The Americans are fighting for world peace." I can imagine you are now replying: "Was world peace really in danger by that local affair in Korea, and, after all, why should we fight since American shores were not threatened?" Well, you are literally right here. But, no doubt, you have just not thought of this:

American shores were not threatened today, but do you know that they will not be tomorrow? Just look at any map, and you'll see how near Communism could be tomorrow if no one stops this advance!

From an American point of view, I could understand your question partly—from a European's, not quite. I, therefore, should kindly like to ask you to consider the following:

You were a European; you had Russia quite close to your borders (or at least one of those Soviet republics, which in fact means something very similar); you watch how Russia occupies—step by step—one country after another (no need to name them all, starting with the Baltic states, down to the Balkans, East Germany and so on, not speaking of heavy and threatening Russian influence in other parts of the world); you must fear that either today or tomorrow it might be your turn to live in a Russian republic! Could you then imagine what it meant to such a

European to see, for the first time, that there was "somebody" strong enough who really did try to stop this advance of Communism?

I do hope you will not call me narrow minded if I speak from my own point of view. But perhaps you find a grain of truth in my letter that might help to answer the question "why?"

Yours very truly,
Margaret Frank
Frankfurt/Main
Germany

* * *

Wants Job Shop Material

Dear Sir:

We sure like your magazine. The more you can get that applies to the job shop, which fixes everything, the better. We try all the new rods, fluxes and gadgets.

Yours very truly,
Ivo V. Pennington
Wauneta, Neb.

* * *

Wants Editorial Reprints

Dear Sir:

In the October issue of THE WELDING ENGINEER you have an editorial entitled "Another Black Eye," which discusses the disastrous General Motors fire at Livonia, Mich.

If possible, we would like to get 100 reprints of this article to be used by our safety and welding departments.

Yours very truly,
M. C. Rixman
Williams & Co., Inc.
Cleveland

* * *

We Aim to Please

Dear Sir:

We have been receiving your publication, THE WELDING ENGINEER, and we have no hesitation in expressing the value it has been to the writer and our entire sales force.

Yours very truly,
Jack Howe
President
Garden State Welding Supply Co.
Jersey City

Next Month:
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PAGE Stainless Steel Wire is precision thread-wound on 25-lb. non-returnable convenient reels which fit popular arc welding machines. Six Page-Allegheny grades; wire diameters: .035", .045", .0625".

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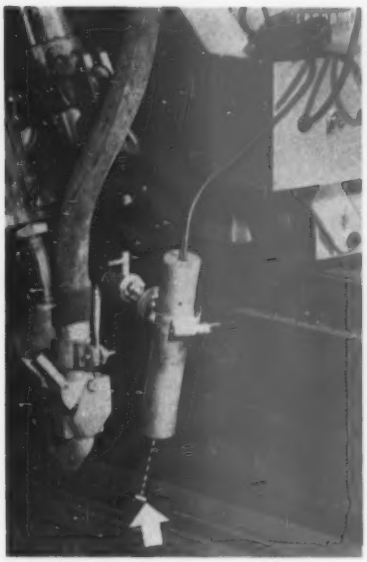


GUIDE light lessens weld repairs

WELDS smoothed with new grinder

MIG welder has selenium rectifier

Automatic Guide Light

PROPER weld action and position can be maintained with this new automatic welding guide light. The light projects a bright in-line spot either in the center of the weld or on a parallel edge. It helps to eliminate weld repairs that are made necessary by off-center welding.

The apparatus includes a stepdown transformer and attaching hardware. In use, the light focuses on the work just ahead of the bed of welding composition. It not only serves to keep the weld on the seam, but also indicates, by adjustment of focus, the height of the contact jaws above the work, an important factor in voltage control.

THE JIMMIE JONES CO., 1016 E. 4th St., Tulsa 10, Okla.

* * *

Portable Welder

WEIGHING only 77 lb, this portable "Junior" arc welder is said to have almost unlimited uses. Ideal for a small shop, it can weld in flat, vertical or overhead positions and can be used wherever a 110-volt or 220-volt a-c connection is available.

This small machine includes equipment for welding, cutting, brazing and soldering in one compact unit. It will weld all commonly used metals and is equipped to use rods of 1/8, 3/32, 5/64 and 1/16-in. diameters. Welding amperage range is from 25 to 100. Dimensions of the welder are 11 by 11 by 16 in.

SHOBER SALES, INC., 900 W. Weber Ave., Stockton, Calif.

* * *

Grinding Wheels

(center photo)

DEPRESSED-center grinding wheels can be used for weld removal, rough grinding, cut-off and slotting operations for ferrous and non-ferrous metals. These "Carboflex" wheels come in sizes of 7 and 9⅛-in. diameters, ⅛, 3/16 and ¼-in. thicknesses and contain a ⅞-in. arbor.

THE CARBORUNDUM CO., Buffalo Ave., Niagara Falls, N. Y.

* * *

Respirator

THIS low-cost respirator is a soft aluminum mask, to which are attached filter pads. It is light in weight and simple to fit. The "No. 84" aluminum mask permits forming to assure comfort and a firm fit.

SELLSTROM MFG. CO., 615 N. Aberdeen St., Chicago 22.

Mig Welder

DESIGNED to further the advances of Mig (metal inert-gas) welding, this new welder maintains stable welding conditions regardless of arc variations. It consists of closely coupled three-phase transformer, saturable-core type three-phase reactor in the primary circuit, control windings and a selenium rectifier stack.

Welding operations are said to be simple. Remote control, using either a foot or hand-operated unit, is available. These Mig welders can be hooked up in parallel to produce greater output. The cabinet has removable sides and top cover, permitting easy access to all parts.

MILLER ELECTRIC MFG. CO., Appleton, Wis.

* * *

Electrode

"XYRON" electrode has a specially designed coating developed for use in welding cast iron. Amperage requirements are extremely low, the 3/32-in electrode operating on from 35 to 75 amp.

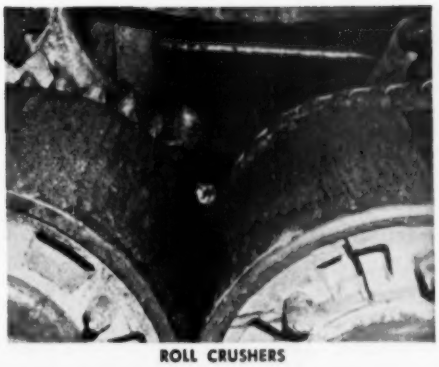
This all-purpose electrode can be used for building up, repairing breaks or cracks, or in fabrication. Its deposits are said to have maximum machinability. Welding in all positions is possible, and repairs may be made without dismantling or special preparation.

EUTECTIC WELDING ALLOYS CORP., 40-40 172nd St., Flushing 58, N. Y.

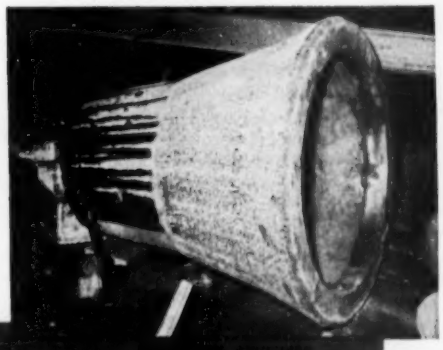
NEW!

COATED TUBE STOODITE

(STOODY 1293)



ROLL CRUSHERS



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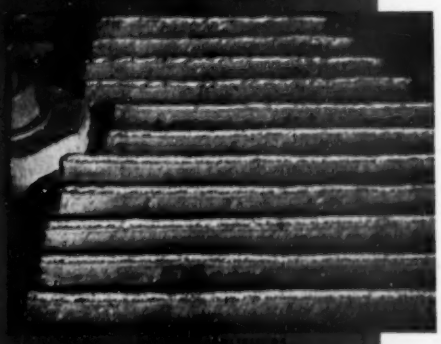
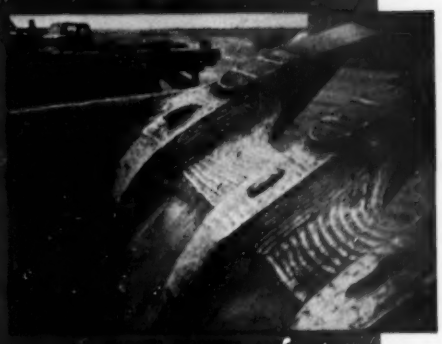
TWICE AS MUCH!





STOODY COMPANY

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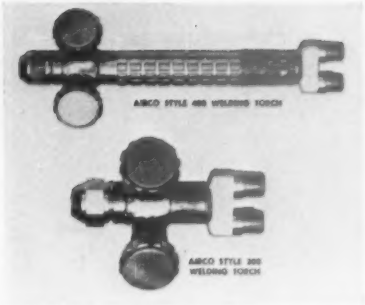


Welding Torches

ONE new torch has been especially designed for light welding and brazing operations, and another primarily for oxyacetylene burning or welding of lead products. The former, "Airco 400," is 5¾ in. long and weighs 6 oz. A cutting attachment, which makes the torch quickly adaptable for occasional cutting jobs, is available. The latter, "Airco 300," is 2½ in. long and weighs 5 oz.

Both torches have ball-type oxygen and acetylene valves that are positioned for easy thumb adjustments.

AIR REDUCTION SALES CO., 60 E. 42nd St., New York City 17.

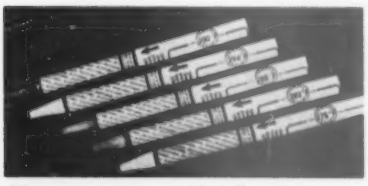
* * *

Aluminum Flux

THIS new aluminum flux is for use in welding aluminum and its alloys. Effective cleaning action of "Type 202" is said to eliminate the need for pickling before welding. Welding work can be clearly seen, states the manufacturer, because the flux breaks up oxides and floats them away. No wiping is necessary.

SOLAR AIRCRAFT CO., Flux Dept., 2200 Pacific Hwy., San Diego 12, Calif.

* * *



Temperature Sticks

"TEMPILSTIKS" for two more temperatures have been developed by the manufacturer. Now available are sticks for 282 and 294 F. The firm now offers a packaged set of five sticks with these two temperature ratings and those for 275, 288 and 300 F.

In use, the appropriate stick is stroked lightly on the surface of the piece, and a liquid smear appears when the temperature reaches the rating of the particular stick used.

TEMPIL CORP., 11 W. 25th St., New York City 10.

Welding Cable

TOUGH "neoprene" compound gives this new welding cable greater durability under severe service conditions, according to the manufacturer. Neoprene is used because of its resistance to heat, hydrocarbons, oils, greases and acids.

The conductor is composed of fine copper wires. The separator is strong paper, which is thin enough so that it does not impair flexibility. The cable is packed in 250-ft coils or 1,000-ft reels and is furnished in sizes from No. 6 to No. 4/0.

DALWELD CO., 1 Bertel Ave., Mount Vernon, N. Y.

* * *

Cover Goggles

VENTILATION has been improved and the area of vision increased in a new cover goggle, designed to fit over large-frame prescription glasses. Weight, however, has been kept to a minimum by the use of light, strong plastics.

These "EyeGard Imperial" goggles for weldors, chippers and grinders use standard 50-mm round lenses and have aluminum rims and side shields. The weldors' goggles have baffled side shields to eliminate light and glare and are furnished with federal specification glare-filter lenses.

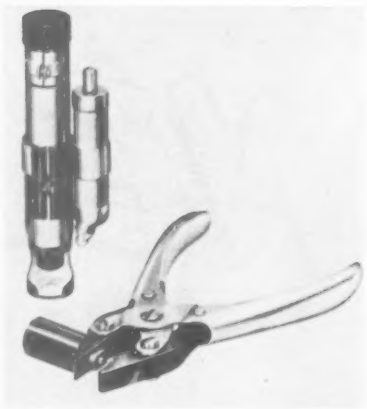
AMERICAN INDUSTRIAL SAFETY EQUIPMENT CO., Lakeside Ave., Cleveland 14.

* * *

Cam Clamp

POSITIVE holding pressure and secure clamping action is said to be maintained on varying stock thicknesses with this "Sesco" cam clamp. The cam surface automatically makes allowance for thicknesses varying as much as ⅛ in. Manufacturer states these clamps can be used for many milling operations as well as for the usual clamping applications.

SPECIAL ENGINEERING SERVICE, INC., 8161 Livernois Ave., Detroit 4.



Hardness Tester

SHEET-metal hardness tester "Model 317" includes a calibrated microscope by means of which readings can be obtained to within two points of the Brinell scale. Sheet stock of from 0.010 in. to 0.250 in. may be measured. The instrument uses a ⅛-in. ball with a 331-lb load.

PACIFIC TRANSDUCER CORP., 11921 W. Pico Blvd., Los Angeles 64.

* * *

Soldering Paste

MOST common metals, with the exception of aluminum, can be sealed, joined or tinned with this soldering paste composed of flux and solder. The paste is applied cold, then heated in any manner to 375 F. In one of its applications (tubing work), pressure tests of up to 6,500 psi failed to break soldered joints.

ALL-STATE WELDING ALLOYS CO., INC., 249-55 Ferris Ave., White Plains, N. Y.

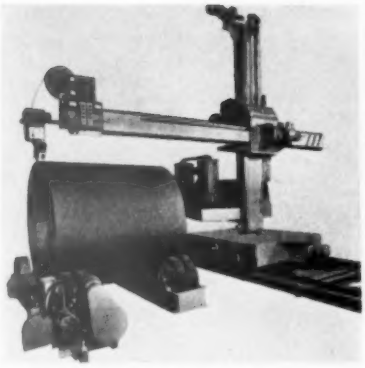
* * *

Electrode Holder

WEIGHING only 27 oz, the "Tweco-tong A-516" electrode holder features air vents between the holder castings and the insulation. On higher amperage work, this permits the heat from the arc (which is absorbed by the castings) to be dispelled through the vent ducts.

The holder has a large-diameter handle that has only point contact with the holder casting, permitting free flow of cooling air. It is designed to handle electrodes through 5/16 in. in diameter.

TWECO PRODUCTS CO., Boston at Mosely, Wichita 1, Kan.



Automatic Welder

UNLIMITED maneuverability is said to make this automatic welder adaptable to any type of weldment. The "welding head manipulator" works as a robot pilot that guides the welding head without manual assistance. It can be used with all types of turning rolls and positioners.

The head swivels 180 deg, and the mast boom rotates 360 deg on a power car that moves on a track at variable welding speeds. All tachometers, gages and push buttons are mounted on a central control panel that swings in a 90-deg arc. Flux dispensing and recovery equipment and the power welding machine are mounted on the mast.

Available in standard models (on power cars or fixed base) with vertical boom travel from floor level to 24 ft and longitudinal boom travel up to 30 ft.

THE PANDJIRIS WELDMENT CO., 5151 Northrup Ave., St. Louis 10.

* * *

Hardfacing Flux

"MAGNECOTE 301" is the first in a series of fluxes of magnetic materials designed for build-up and application of hardfacing overlays. (See page 57). It produces a manganese deposit of full Hadfield properties. Other types of these magnetic fluxes will be marketed shortly.

STOODY CO., 11928 E. Slauson Ave., Whittier, Calif.

* * *

Air Hammer Kits

FOUR new air hammer tool kits are for welding, general maintenance, marine maintenance and foundry. Each kit includes a new 36-oz air hammer, which can be operated in straight line or at a 90-deg angle, and five tools designed for weld breaking, scaling, peening, drilling, metal cutting, smoothing, riveting and rivet breaking.

SALSBURY CORP., 1161 E. Florence Ave., Los Angeles.

Long Life AMPEREX Ignitrons

with NEW

IMPROVED IGNITOR

Will Cut Your Ignitron Costs

The ignitor is the vulnerable element in the ignitron! Disintegration of this important element results in short tube life.

After five years of research in one of the world's most famous laboratories, a radically improved ignitor has been developed. The material used in its construction constitutes a radical departure from previous practice. This new ignitor, so vital in assuring long tube service, has been incorporated into AMPEREX ignitrons.

Another feature of AMPEREX ignitrons is the exclusive DETACHABLE, heavy-duty anode connector.

AMPEREX ignitrons are physically and electrically interchangeable with all corresponding types. Available in all popular types.

IMMEDIATE DELIVERY ON TYPES AX-5551, AX-5552, AX-5555, and AX-5822

Our Engineering Department or Your Local Amperex Representative will be glad to consult with you on any job.

You'll Want This Helpful Amperex Information for Your Reference Files! It's Yours Without Obligation. Mail This Handy Coupon.

AMPEREX ELECTRONIC CORPORATION
230 Duffy Ave., Hicksville, L. I., N. Y.

Please send me, without charge or obligation, the AMPEREX Information I have checked.

- ☐ Technical Data on Amperex Ignitrons.
- ☐ Rectifier, Thyratron and Ignitron Ready-Reference Chart.
- ☐ Condensed Transmitting and Power Tube Catalogue.

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Cable "AMPRONICS"

HOW TO DUCK THE WELD-SPATTER PROBLEM

Use Protect-O-Metal and weld spatter wipes off as easily as water from a duck's back! With Protect-O-Metal you speed welding and save up to 85% of weld cleaning time and labor. Brush or spray P.O.M. in weld seam and on adjacent metal—weld—then brush off spatter in seconds.

Just a little P.O.M. goes a long way too—costs less than 1/10c per foot of weld protected, saves up to three times its cost in time savings alone. Order a trial gallon ($3.25), satisfaction guaranteed or invoice will be cancelled.

PROTECT-O-METAL
POM
GWSMITH

G. W. SMITH & SONS, INC. 5407 KEMP ROAD, DAYTON, O.

CAN YOU WELD MANGANESE . . . ?

easily

YOU CAN — if you use . . .

MANGANAL

U.S. Patents 1,876,738—1,947,167—2,021,945

FLO-KOTE

11% - 13½%
MANGANESE-NICKEL STEEL
AC-DC WELDING ELECTRODES

NOT A COMPOSITE ROD.
ELEMENTS IN ROD, NOT COATING.

Runs as easily as stainless or mild steel electrodes.

Write for literature

STULZ-SICKLES CO.

SOLE PRODUCERS 92 N. J. RAILROAD AVE. NEWARK, N. J.

NEAREST DISTRIBUTOR UPON REQUEST

Electrode Oven

THE "Model 10 DryRod" is a portable electrode oven, capable of holding a full 10-lb package of 14-in. low-hydrogen, stainless steel or other electrodes that must be kept free from moisture. It stands either upright or on its side and will not tip or roll. Approximate dimensions are 20½ in. high and 8¼ in. in diameter. The oven is wired for operation on 110 volts, a-c, and is said to maintain an even flow of heat, affording complete protection against moisture.

PHOENIX PRODUCTS CO., 4715 N. 27th St., Milwaukee 16.

* * *

Bronze Electrode

A NEW phosphor-bronze (Grade C) coated electrode has been specially adapted for use in arc welding manganese-bronze materials. This modified electrode is an addition to the manufacturer's "Weldbest 620C," which is used for welding phosphor bronze and steel.

Specimens exhibit 61,000 psi tensile strength, 32,000 psi yield strength, 45% elongation and 36% reduction of area. Brinell hardness is about 110.

WELDWIRE CO., INC., Emerald & Hagert Sts., Philadelphia 25.

* * *

Hardening Compound

A HARDENING powder, called "Armor-Tuf," is said to harden the softer steels so that they perform like higher-priced metals. The piece is heated to cherry red, coated with the compound, allowed to fuse for half a minute and then quenched. No special heat-treating equipment is necessary. Full instructions come with each package. "Armor-Tuf" is claimed to be non-explosive and non-flammable.

ARMOR-TUF SALES CORP., 299 Madison Ave., New York City 17.

It's the CONNECTION that counts!

cam-lok
cable connectors
proved:

"LOWEST RESISTANCE OF ALL TESTED!"

1 "Connects" easily and tightly
2 "Disconnects" easily and quickly
3 Gives positive contact
4 Insures time and money-saving interchangeability
5 Eliminates arcing and burning

With the same cable, current carrying ability is limited only by the connectors. That's why a noted welding equipment manufacturer tested various makes of connectors. Under a 400 ampere load, the Cam-Lok Connector showed negligible resistance . . . only 10.6 millivolt drop . . . lowest of all connectors tested!

Are connectors the weakest link in your welding lines? Get Cam-Lok. The Double-Cam principle assures most perfect contact possible. The simple, solid brass, precision machined parts are trouble free, even on construction work. Just two interchangeable sizes connect all cables from No. 1 through 4/0.

WRITE FOR FREE LITERATURE TODAY
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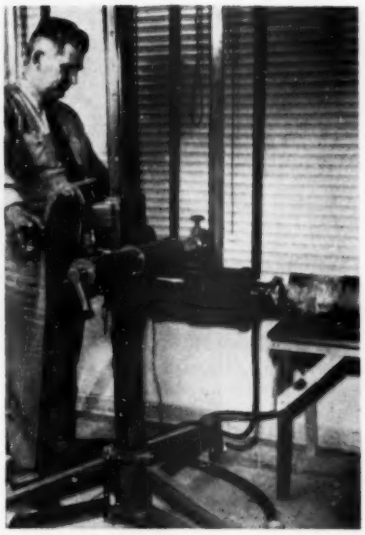
DIVISION OF EMPIRE PRODUCTS, INC.
P. O. BOX 98-B, CINCINNATI 36, OHIO



X-Ray Unit

ONLY one exposure is needed to X-ray a 360-deg weld with the new "MG 150" X-ray unit. Flexibility of this lightweight, compact apparatus permits four types of X-ray tubes to be used. The rod-anode tube can be inserted into a pipe or vessel, making possible the radiographic inspection of circular welds without the need for several exposures.

NORTH AMERICAN PHILIPS CO., INC., 750 S. Fulton Ave., Mount Vernon, N. Y.

* * *

Electrode

"FLO-KOTE" is a new 11 to 13½% manganese-nickel steel welding electrode that is said to run as easily as any stainless or mild-steel electrode, yet provide the advantages of tough, ductile manganese-nickel steel weld deposits.

"Flo-Kote" can be used to join dissimilar metals and welds in all positions. This a-c or d-c electrode can be cut with an ordinary oxyacetylene flame.

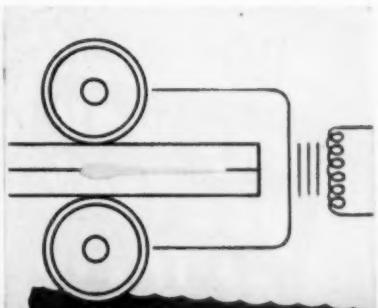
STULZ-SICKLES CO., 134 Lafayette St., Newark.

* * *

Midget Clamps

SMALL in size, two new welding clamps are nevertheless said to have great strength. "Model V-100" has a vertical handle and horizontal mounting surface. It has a clamping force of 100 lb when the spindle is located at the end of the toggle bar. "Model S-100" is for side mounting and also has a 100-lb clamping force when the spindle is at the end of the bar.

LAPEER MFG. CO., 3056 Davidson Rd., Lapeer, Mich.



YOU GET:
2½ Times the Life—
More Production
and Lower Costs

...from AMPCO WELD*
Seam Welding
Wheels

UP to 150% longer service life — that's the record reported by users of Ampco Weld tube and seam welding wheels. And here's why: Ampco Weld wheels have unusual hardness and toughness at elevated temperatures — exceptional resistance to wear — extra durability. And they also have uniformly high electrical conductivity. All this adds up to longer runs, fewer shutdowns, increased production, lower costs.

You can order Ampco Weld wheels as rough forgings, finished blanks, or fully machined, as you prefer.

Ampco Weld wheels are part of an extensive line of Ampco resistance-welding products. All meet or exceed RWMA specifications. And Ampco offers you free, expert engineering service for specialized applications, if you want it. Order Ampco Weld wheels today — watch production step up, costs step down.

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West Coast Plant: Burbank, California
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any way you look at it . . .

IT'S OXO

REDUCES OPERATING COST 90%

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Patented Guard protects Gauges.

Patented internal parts replaced in less than two minutes with only one size common socket wrench.

Stainless Steel tank connections for safety and long life.

America's largest Industrial Plants and Construction Companies are switching to OXO REGULATORS.

OXO WELDING EQUIPMENT COMPANY

1235 West 95th Street, Chicago 43, Illinois

Reinforced Spectacles

THESE new spectacles have a reinforced arch bridge spot welded to a rigid nickel-silver frame. The temple bars are of cable and have plastic covers. A flat front portion on the bars assures comfortable spring action, according to the manufacturer.

The spectacles come in three bridge sizes—21, 23 and 25 mm—and in three styles for each size. The "4100" is without side shields; the "4102" has wire screen side shields; the "4103" has green acetate side shields.

SELLSTORM MFG. CO., 615 N. Aberdeen St., Chicago 22.

* * *

Coiled Phosphor Wire

PRIMARILY for use in overlay applications, this specially processed phosphor bronze (Grade A) coiled bare wire can also be used for joining brasses, tin bronzes, cast iron, etc. It is said to give sound welds with the inert-gas consumable-electrode processes.

It is available in diameters of 0.045, 1/16, 5/64 and 3/32 in. and is layer wound on either spools or rims in 25-lb packages.

AMPCO METALS, INC., 1745 S. 38th St., Milwaukee 46.

* * *

Magnetic Tracer

THIS device is a tracing rotor to follow a steel template. It is designed for use with the "Ultra-Graph" oxy-acetylene torch guiding machine. Two magnetic rollers are locked together with friction rings between them. The adjustable upper body controls compression of the rings and provides smooth cylindrical contact with the upper edge of the template. The rings are compressed to extend slightly beyond the diameter of the body. Magnetic pull between the rotor and template compresses the extended rubber at the line of contact.

The rings are said to be be able to operate more than 50 hours before requiring replacement.

HEATH ENGINEERING CO., Fort Collins, Colo.

Tempilstik°

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in.

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

It's this simple. Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each

gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
188	338	700	1250	1800
200	350	750	1300	1850
213	363	800	1350	1900
225	375	850	1400	1950
238	388	900	1450	2000

Also available in pellet or liquid form.

FREE —Tempil° "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

Tempil° corp.
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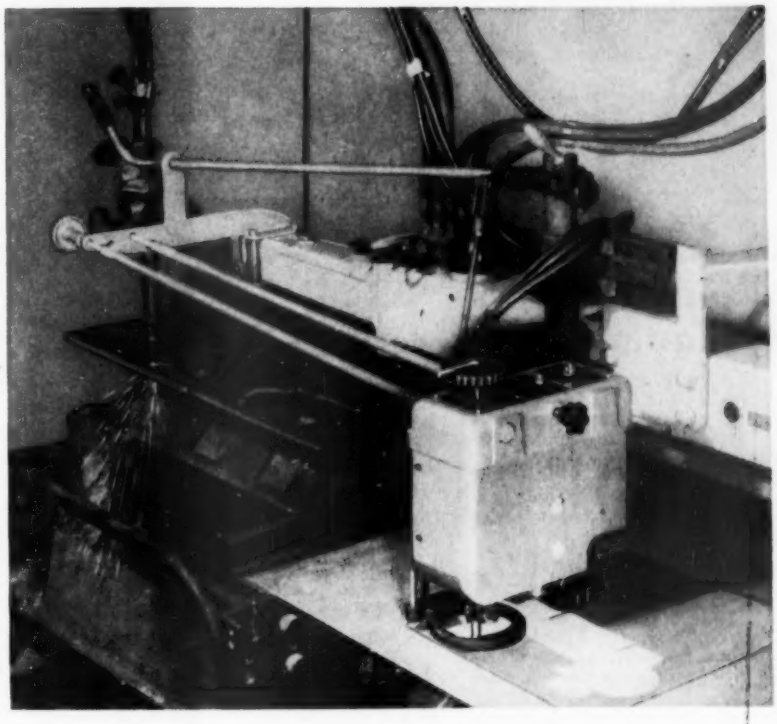
SIMPLIFY Your Shape-Cutting Jobs with the . . .

OXWELD Automatic Tracer

Trade-Mark

- Positive templet contact . . . electronic steering control . . . maximum tracing accuracy
- Templets are easy to make, low-cost
- No kerf allowance required in templet
- Intricate shapes easily reproduced
- Dynamic braking prevents overruns
- Local or remote controls . . . simple to operate



With an OXWELD Automatic Tracer to guide your oxygen-cutting machine, you need never forego the advantages of templet tracing because of time or cost. Whatever the shape—whether you need one piece or many—templet requirements are simple. Just draw your templet, full size, on a thin sheet of inexpensive plastic. Then cut it out with scissors or knife. It's that quick and easy. There's no tedious forming. To compensate for kerf width, just set a handy dial on the Tracer.

The OXWELD Automatic Tracer follows practically any templet shape within extremely close tolerances. It can also be used to hand trace directly from blueprints or drawings. Drive action is smooth and steady with both single- and multiple-blowpipe setups.

Your nearest LINDE representative will be glad to help you plan an OXWELD Automatic Tracer installation to fit either your present shape-cutting machine or one of the available OXWELD Shape-Cutting Machines.

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LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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Put new life into worn equipment

... fight wear and high bearing-pressures with

AMPCO-TRODE* 300 overlays

To get extra dependability, longer service, the operators of this lime kiln overlaid the pinion of the kiln-driving mechanism with Ampco-Trode 300. This stopped the rapid wear caused by the manganese-steel pinion on the cast-steel gear.

Ampco-Trode 300 is *hard*, 300-320 BHN (3000 kg. load)—and has remarkable resistance to wear. In some applications it has increased service as much as 900% over softer materials. It has high compressive strength, too — won't squash out even under terrific pressures.

If you have extreme bearing applications where very high pressures exist, Ampco-Trode 300 is just right for you. Check with your Ampco distributor or write us today.

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AMPCO

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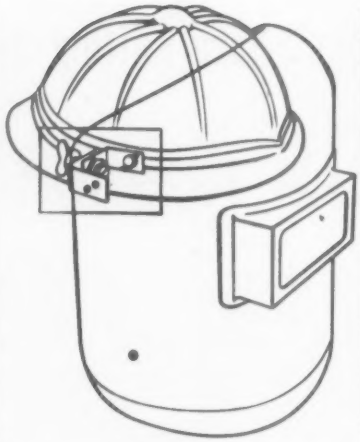
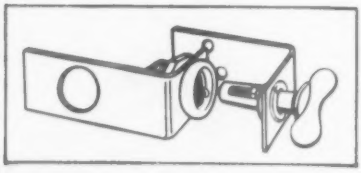
W-125





Helmet Safety Device

WELDORS on construction jobs can quickly separate their masks from helmets without removing the latter by means of this new springlock fastener. A metal post on each side of the mask plugs into a lug fastened to each side of the helmet. A simple twist secures it in place, and a reverse twist disengages it. Manufacturer states it cannot come unfastened accidentally.

This device may be used with helmets and masks other than those made by the manufacturer.

DAVIS EMERGENCY EQUIPMENT CO., 45 Halleck St., Newark.

NEW PRODUCT BRIEFS

Inspector's shield also doubles as a billfold. The center is a tight lens holder that takes standard lens and cover plate. JOHN TILLMAN & CO., 1561 W. 19th St., Long Beach 10, Calif.

* * *

Integral horsepower motors are designed specifically to provide smooth, economical changeover to new standards prescribed by NEMA. A. O. SMITH CORP., 3533 N. 27th St., Milwaukee 1.

* * *

Compact "radector" is for general purpose X-ray, industrial radiography and beta-gamma isotope monitoring. It weighs only 3 lb, and its one-knob control permits inexperienced personnel to learn operation quickly. JORDAN ELECTRONIC SALES, INC., 119 E. Union St., Pasadena.

2 IMPORTANT AIDS FOR WELDERS!

USE YOUR FOOT instead of your head!

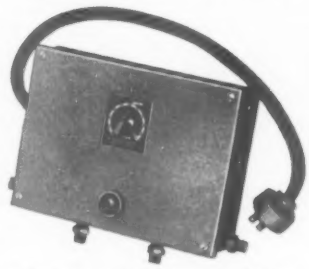
Mullenbach ARCTROL

Makes all welding easier

Adjust heat *WHERE* you weld, *WHILE* you weld! Simply depress foot pedal until exact voltage is delivered. Portable, saves trips to welder; selects correct heat for each job variation. Does not affect range of welder—a *necessity* on precision welding, a *tremendous* advantage on production work. *Available for most makes of D.C. welders. Free circular, state welder make and model.*

Mullenbach GASTROL

Automatic gas-water control for inert gas (Heliarc) welding



- Saves up to 50% of argon or helium gas by limiting flow to welding and cooling periods!
- Increases tungsten electrode life!
- Saves operator's time and eliminates human forgetfulness!
- Makes better welds! Prevents condensation causing contaminated welds by stopping water flow during off-welding periods!
- Low in cost!

Ask for folder

Mullenbach

Electrical Manufacturing Co.

2300 East 27th Street • Los Angeles 58, California

Multi-wheel grinder is said to make possible substantial savings in grinding parts having multiple diameters, such as transmission and motor shafts. NORTON CO., Worcester 6, Mass.

* * *

A master alloy of 5% beryllium in iron has been designed as an answer to demands on the part of ferrous producers for beryllium additions to stainless steels. THE BERYLLIUM CORP., Reading, Pa.

* * *

Fuse puller and test light, made of transparent red plastic, has jaws that hold all cartridge fuses up to 100-amp size. Two 24-in. flexible leads are furnished with each tool. HOLUB INDUSTRIES, INC., Sycamore, Ill.

* * *

Disposable paper work cap is made of heavy paper treated with "neoprene" synthetic rubber. The cap is water-repellent and is treated with a flame-retardant. RECORD INDUSTRIAL CO., 3301 Arch St., Philadelphia 4.

* * *

Heavy mineral build-up of a new type of heavy-coated abrasive belt opens up under work pressure, presenting fresh abrasive grain particles to the workpiece. MINNESOTA MINING & MFG. CO., 900 Fauquier St., St. Paul 6.

* * *

Pencil die grinder weighs only 13 oz and is said to be the only bladed motor of 40,000 rpm on the market. Said to fill the need for a grinder that has plenty of power for small burrs. THE ROTOR TOOL CO., 26300 Lakeland Blvd., Cleveland 23.

* * *

Built-in automatic forced draft equipment, which increases capacity under overload conditions, is featured in a new 2,000 kva transformer. MARCUS TRANSFORMER CO., INC., 32-34 Montgomery St., Hillside 5, N. J.

* * *

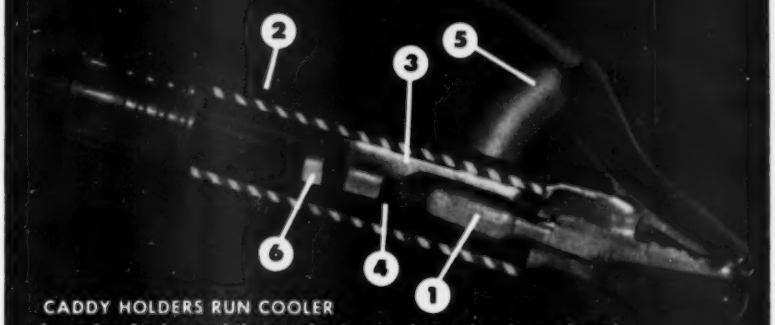
Power-operated vises use the conventional vise screw and handle for presetting the jaw opening to the size of the workpiece. WILTON TOOL MFG. CO., 925-41 Wrightwood Ave., Chicago 14.

* * *

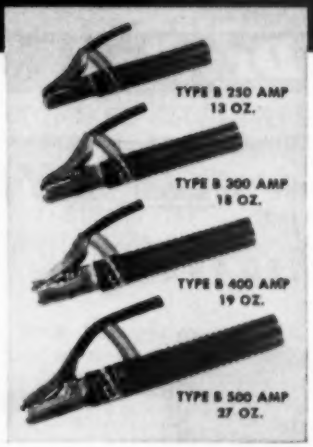
Crystal transducers, or "probes," are for ultrasonic thickness gaging of metal of unusual conformations. BRANSON INSTRUMENTS, INC., 430 Fairfield Ave., Stamford, Conn.

Fully Insulated

NOT ONLY ON THE SURFACE



CADDY HOLDERS RUN COOLER
by going far beyond the regular jaw and tong insulators found on competitive holders to give you the most fully insulated, coolest holder on the market.



COOLER because of 6 major insulation features:

1. The location of the CADWELD connection of the cable to the jaw is 4″ forward from the operator's hand. In other holders it is right under the operator's hand.
2. The operator's hand is over a fully ribbed handle reducing normal contact surface 50%.
3. The body carries no current.
4. Fully insulated cable runs practically all the way through the handle.
5. The tong spring is seated on the non current carrying steel body plus additional insulators at both ends.
6. The cable gripper prevents the cable from flexing or pulling out at the weld.

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ARC WELDING ACCESSORY DIV.

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2070 E. 61st PLACE
CLEVELAND 3, OHIO

"WE CUT REWORKS 94% with DryRod Electrode Oven!"

When 1 out of 3 welded hydraulic fittings were rejected at a leading Milwaukee machinery plant*, engineers blamed *moist electrodes*. Installing a low-cost DryRod Electrode Oven to store all unpackaged low-hydrogen rods, this company got *immediate* improvement . . . faster, better welds . . . few rejects. Their welding engineer said, *"DryRod successfully solved our welding porosity problem. With it we've been able to cut our reworks from 30 pieces to less than 2 per hundred!"*

Get your money's worth

You pay a premium for stainless steel, low-hydrogen, and other mineral-coated electrodes. Preserve that "baked-in" quality with DryRod Electrode Oven. Ask your welding supply dealer, or write direct for free folder.

*Name on request

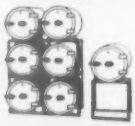
X-DR-12

Cut costs 4 ways with DryRod Method!

1 Store sealed cartons in warm, dry place.

2 Place unpackaged electrodes in DryRod Oven and withdraw as needed.

3 Locate DryRod as close to welding operations as possible.



4 For flexible, large-volume storage, stack ovens with compact DryRod Stands.

DryRod DIVISION OF Phoenix Products Co.
4715 N. 27TH ST. MILWAUKEE 16, WIS.

the "greatest" **EYE** protection and comfort

EYEGARD IMPERIAL COVER GOGGLES

fit over the largest prescription glasses

#500 WELDERS COVER GOGGLES with baffled side shields

#501 CHIPPERS AND GRINDERS COVER GOGGLES with perforated side shields

Look at these features

- Uses standard 50 MM round lenses
- 22% larger than ordinary goggles
- More ventilation through cup slots —no fogging of lenses
- Feather-weight aluminum rims and side shields
- Face shaped contour to fit snugly, comfortably
- Available with or without metal adjusting top bar

New Eyegard Imperial Goggles provide the maximum in protection and comfort . . . the most desirable features of any cover goggles on the market today.

Compare their quality and design . . . then compare their cost and see why you get more for less with Eyegards. Avoid substitution, insist on Eyegard Imperial Goggles. Write for literature and prices.

AMERICAN INDUSTRIAL SAFETY EQUIPMENT COMPANY
3503 LAKESIDE AVENUE CLEVELAND 14, OHIO
Division of The Burdett Oxygen Company, Cleveland, Ohio

MAGNETIC FLUX

(Continued from page 57)

ous electrode diameters. Welding time and material costs are shown to be markedly reduced.

Can See the Arc

The magnetic process eliminates considerable flux waste since all the flux applied to the wire is consumed. The ratio of flux used to metal deposited is approximately one to one.

An important consideration is the fact that with the magnetic process the weldor is using an open arc. He can see the actual welding at all times, which gives him a better control of the deposit and permits the hardfacing of irregularly shaped parts. Another advantage of the open arc magnetic method is that no flux dams, jigs or fixtures are needed.

The squirt welders now in common use may all be readily adapted to operate with magnetic-alloy flux. The adapter tip containing the permanent magnets centers the wire to assure a concentric flux coating and governs the amount of flux applied to the wire. The photographs and sketch show clearly how easily the adaptation is made.

Necks Craned to Watch This Welding Job

A RECENT welding job in Chicago must have resulted in at least a few stiff necks. A crowd, estimated in the hundreds, watched two weldors work on a television antenna almost 600 ft above the ground. The tower is on top of a 39-story Loop building, which is 482 ft high. The antenna extends about another 200 ft above the building. The workers were welding stand-by antennas to the tower holding the main antenna.

* * *

Bulletin on Aluminum Issued by RWMA

"ALUMINUM Welding" is the title of a new 21-page booklet recently released by the Resistance Welder Manufacturers Association. The bulletin (number 18 in a series) covers in detail the preparation of aluminum and its alloys for welding and gives the technical aspects of the welding process. It is illustrated with diagrams, tables and photographs and can be obtained from RWMA headquarters, 1900 Arch St., Philadelphia 3, for 20 cents per copy.

Welding Solves a Navy Problem

WELDING was used recently to pull the Navy out of a tough spot. A portal gantry crane with a long reach and extraordinary lifting capacity was needed at the Philadelphia Navy Yard in order to help modernize aircraft carriers of the Essex class. Methods other than welding involved costly procedures and impossible patterns.

Acme Welding Division, United Tool and Die Co., West Hartford, Conn., made the needed drums and bolsters from steel weldments. This assured uniformity of strength and smoothness of the giant crane, which swings its 230-ft boom 360 deg.

* * *

Name of Subsidiary Changed by Fansteel

THE name of Weiger Weed & Co., Detroit, has been changed to WW Alloys, Inc., Division of Fansteel Metallurgical Corp., North Chicago, Ill., according to a recent announcement by the parent company.

For several years, the WW division specialized in products for resistance welding. Now that it is also producing copper-base alloys for other applications, a name of a more metallurgical nature is desirable, the announcement stated.

* * *

England Claims Discovery of Strongest Weldable Steel

"FORTIWELD" is the name of what is said to be the strongest type of weldable steel yet made. Not much technical information is available on the discovery, which was made accidently by United Steel Co., Ltd., Sheffield, England.

A tensile strength of 40 tons to the square inch is claimed for the new steel. Apart from great strength and easy weldability at ordinary temperatures, "Fortiweld" is said to possess good properties at temperatures of from 842 to 932 F. It will withstand service stresses two to three times greater than those permissible with mild steels.

"Fortiweld" is a low-carbon, ½% molybdenum steel containing boron. Its high strength at ordinary and elevated temperatures, coupled with its ease in welding, have led to its use in the aircraft industry for jet engine parts, especially flange rings and combustion-chamber casings. The combination of its properties permits the use of thinner and lighter sections of steel.

—McGraw-Hill World News

this new WELDING DESIGN MANUAL

FOR THE ASKING

To assist you in your re-tooling problems . . . or to help you analyze your present welding methods so that you may enjoy maximum speed, efficiency, and economy in many of YOUR production problems . . .

Giant new 4th Edition contains 62 new photographs, 132 new drawings, 72 pages of helpful data covering basic and advanced welding techniques and designs used in fabricating and assembly. Profusely illustrated with application drawings; weld diagrams; tables of melting temperatures, strengths, corrosion factors; charts; alloy recommendations; etc. Convenient digest size.

This just-off-the-press book is "must" reading for anyone engaged in defense production and design, and will certainly be time profitably spent for any production man.

SEE ...The unbelievable savings in metal-joining which can now be yours through the use of "Low Temperature Welding Alloys"® discovered a few years ago and now used in over 78,000 industrial plants throughout America for more efficient metal-working production as well as for salvaging irreplaceable tool and machine parts.

Over 100 different, new, EUTECTIC Low Temperature WELDING ALLOYS® and EUTECTOR® Fluxes are job-engineered for use on ALL metals – cast iron, alloy steels, aluminum, copper and nickel alloys, die castings, overlays, etc., and may be applied with ALL heating methods – torch, arc, furnace, induction heating, etc.

SEND FOR YOUR COPY TODAY!

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This new manual of yours sounds like a very helpful book. Send me a FREE copy with the understanding that there will be no cost or obligation now or later.

*Signed*_____

*Firm*_____

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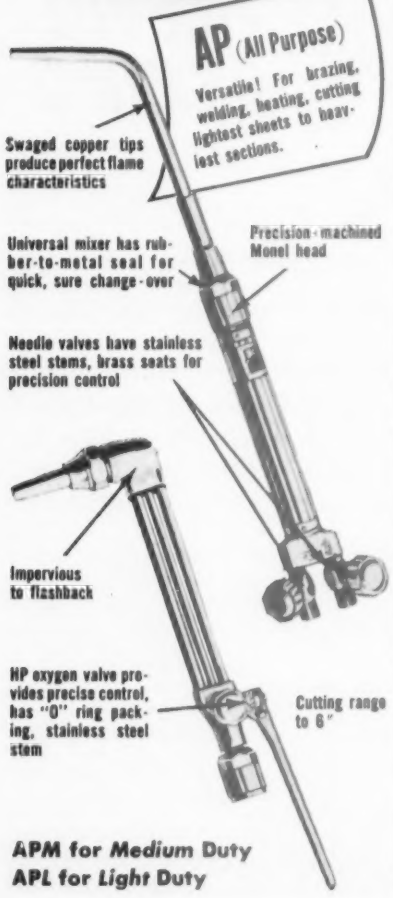
Welding & Cutting
TORCHES


AP (All Purpose)
Versatile! For brazing, welding, heating, cutting lightest sheets to heaviest sections.
Swaged copper tips produce perfect flame characteristics
Universal mixer has rubber-to-metal seal for quick, sure change-over
Precision-machined Monel head
Needle valves have stainless steel stems, brass seats for precision control
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HP oxygen valve provides precise control, has "O" ring packing, stainless steel stem
Cutting range to 6"

APM for *Medium* Duty
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ALL Precision-machined of Quality Materials—to Give You the *Finest.*

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—or address The K-G Equipment Co. (Inc.) Dept. A, 1744 Lehigh St., Allentown, Pa.

DISTRIBUTORS! Valuable Franchises available. Write for details.

Award Shell Contract to Cleveland Welding Co.

ONE of 1953's largest Army shell contracts was awarded to Cleveland Welding Co., a subsidiary of American Machine & Foundry Co. The contract was for $1,521,000, and production under it will continue through this year.

The firms's civilian production includes bicycles, truck and tractor tire and wheel rims and other circular welded and rolled items. Under an older contract, the company has been producing 81-mm mortar shells since May, 1952.

* * *

Chemical Plant Installs Welded Concrete Pipe

IN order to provide sea water for process cooling, the Dow Chemical Co. plant at Freeport, Tex., recently installed concrete piping, sections of which were welded together. The concrete lining is centrifugally cast on the inside of a metal shell. Additional concrete is then applied in a layer outside the shell. The metal core allows the joints to be welded, according to the *Dow Texan.*

* * *

Spectrographers to Hold Symposium in Chicago

"DIRECT-Reading Emission Spectroscopy" will be the subject of a symposium to be held May 7 in Chicago by the American Association of Spectrographers. The symposium will have sessions on iron and steel, nonferrous metals and metal in nonmetallic materials. Contributed papers are welcome. Address all inquiries to: M. E. Slagel, Chairman. U. S. Reduction Co., Box 30, East Chicago, Ind.

* * *

Fire Underwriters Issue Cutting, Welding Standards

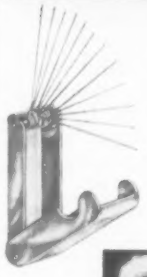
NATIONAL Board of Fire Underwriters has just issued a new publication dealing with standards for installation of gas systems for cutting and welding. A copy can be obtained by writing the Board at 85 John St., New York City 38.

* * *

Aluminum Institute Changes Name

THE Aluminum Research Institute has changed its name to Aluminum Smelters Research Institute. The new name more clearly indicates the scope of the organization, which for 24 years has been the trade association of the aluminum smelting industry.

Welding Engineers prefer *THERMO* spiral tip cleaner design...

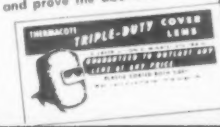


So do welders because they know how the spiral design of Thermo Tip Cleaners removes carbon and slag without scratching or enlarging. Buy Thermo Spiral Tip Cleaners in handy metal case. 12 sizes.

Precision manufactured and guaranteed unbreakable or replaced free.

SAVE 95.5%
ON COVER LENS COST
Send for free sample of the Triple Duty Cover Lens and prove the above claim.

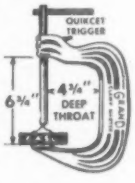
At all Welding Supply Dealers



THERMACOTE CO.
NEWARK • CHICAGO • LOS ANGELES

GRAND
SPEED CLAMPS
A S L SERIES
SAVE MINUTES ON EVERY CLAMPING OPERATION!

Grand Speed Clamps are quick setting and instant releasing—just push down the screw and tighten with a turn on the vise-type handle. Trigger releases work instantly.



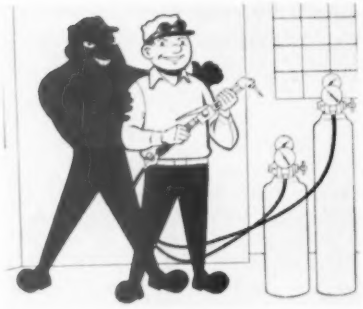
Grand Speed Clamps have extra deep throats—are ruggedly built of NACO No. 6 Steel—spatter proofed.
4 Sizes: 2" to 8" Opening

Famous GRAND "C" Clamps
Alloy Steel (Stronger than forged) Spatter-Proofed Screws, Deep Throat—Replaceable Swivels

LIGHT SERVICE SERIES	MEDIUM SERVICE SERIES	HEAVY SERVICE SERIES
L SERIES	ASM SERIES	ASH SERIES
8 SIZES 2" TO 12"	7 SIZES 4" TO 18"	9 SIZES ⅛" TO 12½"

Ask Your Supplier

GRAND SPECIALTIES CO.
3101 W. GRAND AVE., CHICAGO 22



Air Reduction Produces Film on Welding Safety

SAFETY in the use of oxacetylene cutting and welding equipment is the subject of a new sound slide-film produced by Air Reduction Sales Co., New York City. Entitled "The Guy Behind Your Back," it has a light, but not comic, approach to safety problems. Running time is 20 minutes. The film is designed for use by companies to train their own employees.

* * *

This Welding Engineer Is a Lady!

NOT many of the fairer sex can be found among the ranks of welding engineers, although a great number are weldors. One of the rare specimens is Mrs. Ruth Payne, who has been with the U. S. Naval Engineering Experiment Station, Annapolis, Md., since 1942.

Said to be the Navy's only lady welding engineer, she specializes in developing welding procedures for ship propulsion shafting. A graduate of the University of Alabama, Mrs. Payne is with the Naval Station's welding laboratory. She is a member of the American Welding Society.

* * *

ASTM Approves AWS' Request for Test Space

THE advisory committee on corrosion of the American Society for Testing Materials at a recent meeting decided to expand its facilities at various test stations. Although there is some unused space at all of the sites, the committee agreed that 110 additional racks be fabricated to provide space for more specimens.

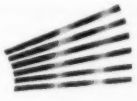
The committee has approved the American Welding Society's request for the use of pipe-frame space at New York, Kure Beach, Columbus, Point Reyes, East Chicago and Freeport. The AWS program consists of more than 4,000 specimens designed primarily to test the effectiveness of sprayed metal panels, including coatings of aluminum and zinc.

NO MATTER WHERE YOU ARE

A GB DISTRIBUTOR is ready to give you practical, "down-to-earth" help on your silver brazing jobs.

GB's Distributor Sales Organization is made up of experienced salesmen who have a broad background of practical operating experience, as well as technical training, in silver brazing applications. One of those men is in your area—and he wants to work with you to find how GB Silver Brazing Alloys and GB Fluxes will speed up your operations, give you maximum results and save you money.

Each GB standard Silver Brazing Alloy is developed for specific cost and production requirements. They are all available in these easy-to-use forms . . . wire in coils or straight lengths, strips, sheets, simple or intricate formed pieces.



Call in your GB distributor for all the facts about the GB line—he'll gladly supply you with working samples of GB alloys and fluxes, as well as give you helpful assistance on any brazing problems you may have. (If you don't know his location, simply write us and we'll send his address.)

GB FLUXES . . . available in three main types to cover the low temperature silver brazing range:
GB No. 99—working range up to 1350° F
GB No. 88—working range up to 1650° F
GB No. 27—working range up to 2000° F

GB FLUXES . . .
Dissolve metallic oxides readily
Provide uniform flow of silver brazing alloy
Insure high joint strength

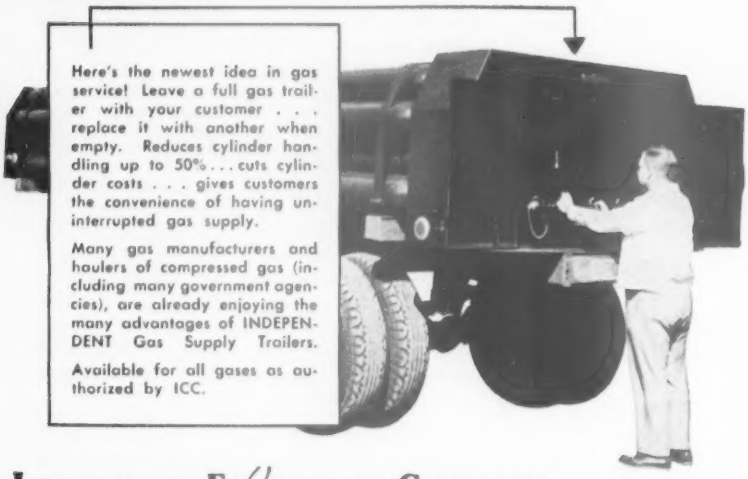
GB FLUXES

The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder—they were developed to produce maximum results when used together.

GOLDSMITH BROS. SMELTING & REFINING CO.
1300 W. 59th, CHICAGO, ILL.
Suppliers of Precious Metals to Industry Since 1867

REDUCE CYLINDER HANDLING

Up to 50% with INDEPENDENT Gas Supply Trailers!



Here's the newest idea in gas service! Leave a full gas trailer with your customer . . . replace it with another when empty. Reduces cylinder handling up to 50% . . . cuts cylinder costs . . . gives customers the convenience of having uninterrupted gas supply.

Many gas manufacturers and haulers of compressed gas (including many government agencies), are already enjoying the many advantages of INDEPENDENT Gas Supply Trailers.

Available for all gases as authorized by ICC.

INDEPENDENT ENGINEERING COMPANY, Inc.

CONSULTING · DESIGNING · RESEARCH

Manufacturers of CYLINDERS AND GAS PRODUCING EQUIPMENT ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

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Silver Brazing Alloy preforms for Production Brazing. Rings, Stamped or Coined Washers and Wire Forms

All inquiries given immediate attention and shipments made on short notice. Technical service men are available to assist you in proper joint design. Silvaloy brazing alloys also available in wire, strip, and powder from stocks in six branch warehouses.

1200 FLUX

for silver brazing Brass, Stainless Steel, Bronze, Nickel-Silver, Steel, Monel, Inconel, Nickel. Furnished in ½ lb., 1 lb., 5 lb., 30 lb., and 65 lb. containers.

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OFFICES: KANSAS CITY, GRAND RAPIDS

Another Victory for Word "Flammable"

THE battle over the use of "inflammable" vs. "flammable" has resulted in another victory for the latter. It has been accepted by Webster's *New Collegiate Dictionary* as being clearer. The word "inflammable" has often been mistaken by many persons to mean non-flammable.

Organizations that have campaigned for better understanding of the terms and have adopted "flammable" in codes and standards include the International Acetylene Association, American Welding Society, Compressed Gas Association, National Board of Fire Underwriters, National Safety Council, American Society for Testing Materials, American Standards Association and National Fire Prevention Association.

* * *

Welding Prize Winners Announced by Eutectic

WINNERS in the 1953 international $2,000 prize competition devoted to "Technical and Research Aspects, Advances and Advantages of the Uses of Lower Melting (lower than parent) Filler Metals in the Non-Fusion Welding Process" have been announced by Eutectic Welding Alloys Corp.

First-place winner in the "A" category (technical and theoretical) was Arthur S. Laurenson, of Belmont Smelting Refining Works, Inc. Top winner in the "B" category (practical applications) was John H. Morton, of Baltimore.

* * *

Japanese-American Firm Formed by Worthington

JOINT incorporation of a new Japanese-American company — Niigata Worthington Co. Ltd. — was announced recently by Worthington Corp., Harrison, N. J. The U. S. firm has associated itself with the Niigata Engineering Co., Ltd., manufacturer of heavy machinery and capital goods. The new organization will manufacture and sell many lines of the American parent company's products.

* * *

Industrial Health Congress in Louisville, Feb. 23-25

INDUSTRY'S role in maintaining the nation's health and health problems of the worker will be discussed at the 14th annual Congress on Industrial Health, to be held Feb. 23-25 in Louisville under the sponsorship of AMA's Council on Industrial Health.

Chicago, Pittsburgh Vie as Engineering-Center Sites

CERTAIN major cities in the country are scrambling to bring the headquarters of the "founding" engineering societies to their back yards. The mad scramble began when it was learned that the American Society of Civil Engineers, American Institute of Electrical Engineers, American Society of Mechanical Engineers and American Institute of Mining and Metallurgical Engineers were planning to move from their present New York City building.

Reports have Chicago and Pittsburgh making the most headway in their efforts to persuade the groups to move from the East. Each has offered either land or money toward a building. But, as this was being written, no decision had been forthcoming. In fact, the societies haven't indicated that they will move from New York, although it is felt the groups would not be able to acquire the needed land and/or building in that city.

* * *

Employees Fete Executives of All-State Welding Alloys

AMICABLE relations between management and labor were spotlighted recently when employees of All-State Welding Alloys Co., Inc., White Plains, N. Y., sponsored a testimonial dinner for the firm's executives. Table cigar lighters were presented to President Thomas Nast and Vice-President Richard H. Mandel by Charles J. Oleson, works manager, who represented the employees.

* * *

Large Copper Producer Enters Aluminum Field

THIS nation's largest producer of copper, Kennecott Copper Corp., is entering the aluminum industry. It was to have purchased a new series of convertible preferred stock, as well as 100,000 shares of common stock, from Kaiser Aluminum and Chemical Corp.

* * *

Distributor Appointments

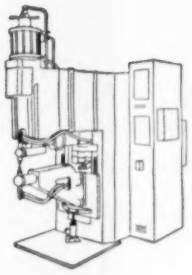
Ampco Metal, Inc., Milwaukee: Steel Products and Mfg. Co., Huntington, W. Va.; Western Oxygen, Inc., Seattle, Wash.

KSM Products, Inc., Merchantville, N. J.: S & S Industries, Inc., Houston.

Rivett Lathe & Grinder, Inc., Boston: Ficke Engineering & Supply Co., Wichita, Kan.

Taylor Forge and Pipe Works, Chicago: Norton, Inc., Milwaukee.

HERE'S WHAT WE MEAN BY *Engineering Assistance*



Application Engineers

T-W's Application Engineers work with you on properly applying resistance welding to your product. They give you specific answers and recommendations for your product and your production.

Design Engineers

The Design Engineers are specialists in creating welders specifically for your work. They take over when the Application Engineers have worked up the basic requirements with you.

Field Engineers

T-W has Field Engineers available in the areas near the cities listed here. They can give you on-the-spot, authentic answers to your questions. They will save you a lot of time. When you operate your welding equipment, they are on call to give you service.

Resistance Welders Since 1898

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RESISTANCE WELDERS

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BECKER HAS IT OR CAN MAKE IT!

IF IT'S CARBON

KEEN-ARC CARBONS

Cored and heavily copper coated for twin arc torches.

WELDER BRUSHES

The "right" brush for every type and make of welding equipment.

ELECTRODES and RODS

All standard types and sizes.

PLATES

1/4" thickness and up.

PASTE

Heat resistant, easily molded

PLATES and PASTE ASSORTMENT

$24.50

A handy assortment, developed especially for welding departments or small welding shops.

COMPLETE BECKER ENGINEERING SERVICE
is always available and entails no obligation whatever.

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SPECIAL GLOVE DEVELOPMENT BY RACINE

THREE STYLES

- 380 Horsehide
- 384 Pearl Carpincho (wildpig)
- 386 Cowhide

Chrome tanned Heat Resistant Split Leather—Heat Breaker Back Lining—LARGE size—

1 One piece back.
2 One piece palm.
3 Thumb seam protected by wide leather strap.
4 All vulnerable seams welted.
5 Palm side of thumb is protected by extra leather overlay.

• Send for booklet on these and other GAUNTMEN Protective Equipment.

RACINE GLOVE COMPANY, INC.
RIO, WISCONSIN

W-AL-CO RODS
for Welding of
ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire
TYPES 25, 43 and 52
Brazing 718

Aluminum Solder

White Metal

WELDING ALLOYS MANUFACTURING CO.
744 Broad St., Newark 2, N. J.

JOE CONLON has been named president of Mid-Jersey Equipment Co., subsidiary of Essex Welding Equipment Co. He succeeds A. C. AXTELL, who assumed the vice-presidency formerly held by Mr. Conlon. Mr. Axtell continues as president of the parent company.

* * *

EDWARD C. LOGELIN has been named vice-president of United States Steel Corporation in Chicago. He succeeds ARTHUR C. WILBY, who retired the first of this year. Mr. Logelin joined U. S. Steel in 1930 in the advertising department of Universal Atlas Cement Co. In 1937 he was appointed assistant to Mr. Wilby, then manager of public relations in the Chicago district for Carnegie-Illinois Steel Corp. He succeeded Mr. Wilby as director of public relations in 1946.

Logelin

* * *

DR. ERNEST WEINER, president of Special Welding Alloys Co., Long Island, N. Y., recently returned from a two-month trip to Europe. He said the economies of Switzerland and Western Germany are on a par with each other, both highly progressive. The former is exporting a considerable amount of electrodes.

* * *

KENNETH W. HORSMAN has been appointed general manager of Worthington Corp.'s Plainfield, N. J., Works. Among the products manufactured at Plainfield is welding positioning equipment. PAUL J. FOLEY has been named general sales manager for all products made at Plainfield. JOHN F. WEISSERT has been named general superintendent of plant operations at the same location. W. J. FLEMING has been transferred to Worthington's Holyoke, Mass., Works, where he will be in charge of the sale and distribution of portable air compressors and air tools.

"FLUX-WELL"
Welding Fluxes

No. 1—WELDING FLUX
For Cast or Malleable Iron

No. 2—BRAZING COMPOUND
For Brass, Bronze, Steel Brazing

No. 4—ALUMINUM FLUX
For Cast or Sheet Aluminum

No. 5—BRAZING COMPOUND
For Cast or Malleable Iron

Write for Free Folder!

Weld Rod Division

THE CHICAGO HARDWARE FOUNDRY CO.
NORTH CHICAGO, ILL.

now
PIERCE
LONG RANGE
UNIVERSAL GOVERNOR

fits 9 out of 10 industrial gasoline engines

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gives long range speed selection

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accurate "variable speed" or "constant speed" engine control between 1200 and 2200 RPM

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Pierce is the most widely used governor for engine-driven welders

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See your dealer or write to:

THE PIERCE GOVERNOR CO., INC.
1618 Ohio Avenue
Anderson, Indiana

WORLD'S MOST EXPERIENCED GOVERNOR MANUFACTURER

LAWRENCE C. SHEAFFER has been appointed welding application engineer for the North Pacific District of Westinghouse Electric Corp. He is located at the company's Seattle headquarters, 3451 E. Marginal Way. He formerly was a salesman for Seattle Marine and Fishing Supply Co.

* * *

HAROLD MACAULEY, of Wolverine Gas Products, Inc., Saginaw, Mich., was elected president of the Independent Oxygen Manufacturers' Association at the annual meeting, which was held at the Shamrock Hotel, Houston. He succeeds MARVIN WHITE, of Welding Gas Products Co., Chattanooga, who became a member of the executive council

Macauley

* * *

FRED MACKEY, vice-president in charge of manufacturing for A. O. Smith Corp., has returned to Milwaukee headquarters to assume larger responsibilities in the administration of company-wide manufacturing problems. He had been located at Landing Gear Division, Toledo, O., and divided his time between that activity and the Airframe Division, Rochester, N. Y. ARNOLD J. RISTOW, who had been managing the Rochester plant, also returned to Milwuakee to join Mr. Mackey's staff. WILLARD L. FRANCE succeeds him as works manager at Rochester.

* * *

WILLIAM P. GOOD has been appointed manager of the new welding equipment division of Crerar, Adams & Co. A member of the American Welding Society, he has been in the industry for 18 years. Four of those years were spent in the research departments of two leading welding-equipment manufacturers. He was also sales manager of the Viking Division of Progressive Welder Sales Co.

* * *

EWART GREIG has been named president and director of Union Carbide Canada, Ltd., subsidiary of Union Carbide and Carbon Corp. He formerly was vice-president of National Carbon, Ltd., a unit of the parent company. National Carbon and five other Canadian units are now operated as divisions of the subsidiary firm.

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NOTE TO DEALERS: When ordering in standard dozen lots, we recommend 2 of 39-A, 4 of 39-B, 4 of 39-C and 2 of 39-D. This assortment seems most satisfactory and is based on actual requirements in industrial plants.

This eye shield is available at all better class dealers. Write us direct if additional information is desired, not only regarding this shield but any and all eye and face hazards existing in your plant.

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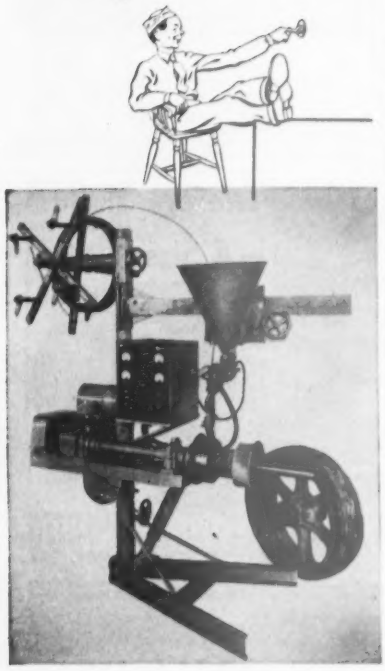

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GRANT H. ARRASMITH has joined the engineering staff of the Brake Shoe & Castings Division of American Brake Shoe Co., Mahwah, N. J. A graduate of Purdue University, he formerly was mechanical inspector for the Chicago Burlington & Quincy Railroad, Chicago.

* * *

HORACE E. WOOD has been appointed Far Eastern manager for the Worthington Corp. and will make his headquarters with Niigata-Worthington Co. in Tokyo. The Harrison, N. J., firm recently joined with Niigata Engineering Co., Ltd., in incorporating the new Japanese-American company. Mr. Wood will be responsible for the development of the new organization's activities, its liaison with Worthington and the promotion of sales in the Far East. He has been with Worthington since 1940.

* * *

CHARLES E. HEITMAN, formerly manager of the automotive division of A. O. Smith Corp., has been appointed to the newly created position of assistant to the general manager of the company.

* * *

LANCE H. COOPER, chairman of The Mond Nickel Co., Ltd., London, has been elected a vice-president of its parent company, The International Nickel Co. of Canada, Ltd. He joined Mond in 1926.

* * *

S. V. V. HOFFMAN has been appointed manager of the west coast sales district of Raybestos-Manhattan, Inc., Passaic, N. J. His headquarters will be in Los Angeles, where he had been regional manager since 1951.

* * *

JOHN W. BODWELL has been appointed manager of the work order department, Chicago plant, of Joseph T. Ryerson & Son, Inc. He was formerly manager of the Cleveland work order department and has been with the firm since 1933.

* * *

DOUGLAS OGILVIE has joined the sales force of Mid-Jersey Equipment Co., welding supply distributor of Livingston, N. J. His experience in the industry dates back more than 17 years.

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Dept. WE-72, 2633 S.E. 4th St., Minneapolis, Minn.

30 YEARS AGO

(Taken from THE WELDING ENGINEER *of February, 1924)*

FLUXES and their functions are discussed in this issue by James Caldwell, of Alloy Welding Processes, Ltd., London. The article was taken from a paper read before the American Welding Society in New York last November.

—30 YEARS AGO—

PROFESSOR Elihu Thomson, one of the founders of General Electric Co., has been awarded the Lord Kelvin gold medal and will go to England during the coming summer to receive the honor. He is the first American to receive this award, which was made jointly by British and American engineering societies.

—30 YEARS AGO—

F. M. BECKET, chief metallurgist of the Electro Metallurgical Co. and vice-president of Union Carbide and Carbon Research Laboratories, Inc. (both subsidiaries of Union Carbide and Carbon Corp.), was awarded the Perkin Medal of the Society of Chemical Industry last month.

—30 YEARS AGO—

W. R. NOXON has been appointed general sales manager of Burdett Mfg. Co., Chicago. He is well known to the welding industry through his former association with Davis-Bournonville Co. and with Alexander Milburn Co.

—30 YEARS AGO—

INSTALLATION of an air liquefaction oxygen producing unit in the Simmons Co. plant, Kenosha, Wis., was recently completed by M. Keith Dunham, Chicago.

—30 YEARS AGO—

THE plant of the Minnehaha Welding and Machine Co., Minneapolis, will soon be enlarged by a two-story addition, which will be used as a machine shop.

—30 YEARS AGO—

C. L. BASTIAN, of the Bastian-Blessing Co., is on his way west to spend a winter vacation in California. His firm recently moved to its new factory at 240 E. Ontario St., Chicago.

—30 YEARS AGO—

SCOTT WADE, of Acetylene Products Co., Indianapolis, visited Chicago early this month.

If you use torch brazing in production

GASFLUX BRAZING PROCESS will save you big money

GASFLUX eliminates dipping, brushing, spillage and waste of flux.

GASFLUX makes stronger, tighter joints with less brazing alloy.

GASFLUX eliminates cleaning operations because it leaves the braze clean—no residue.

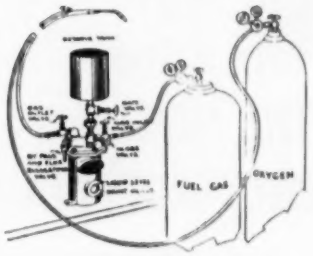
GASFLUX prevents formation of black oxide scale.

GASFLUX assures better penetration of brazing alloy.

GASFLUX eliminates porosity in brazed joints, saves high cost of rejects.

GASFLUX improves production rates up to 25%.

GASFLUX works equally well with copper-base and silver-base brazing alloys.



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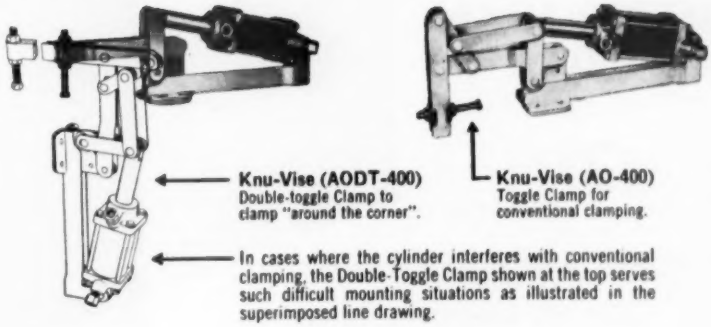

Knu-Vise (AODT-400) Double-toggle Clamp to clamp "around the corner".

Knu-Vise (AO-400) Toggle Clamp for conventional clamping.

In cases where the cylinder interferes with conventional clamping, the Double-Toggle Clamp shown at the top serves such difficult mounting situations as illustrated in the superimposed line drawing.

Available in 3 series

- **For 200 lbs. clamping force—Models AO-200 and AODT-200**
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Cylinders can be easily rotated to suit air supply from either left or right side.

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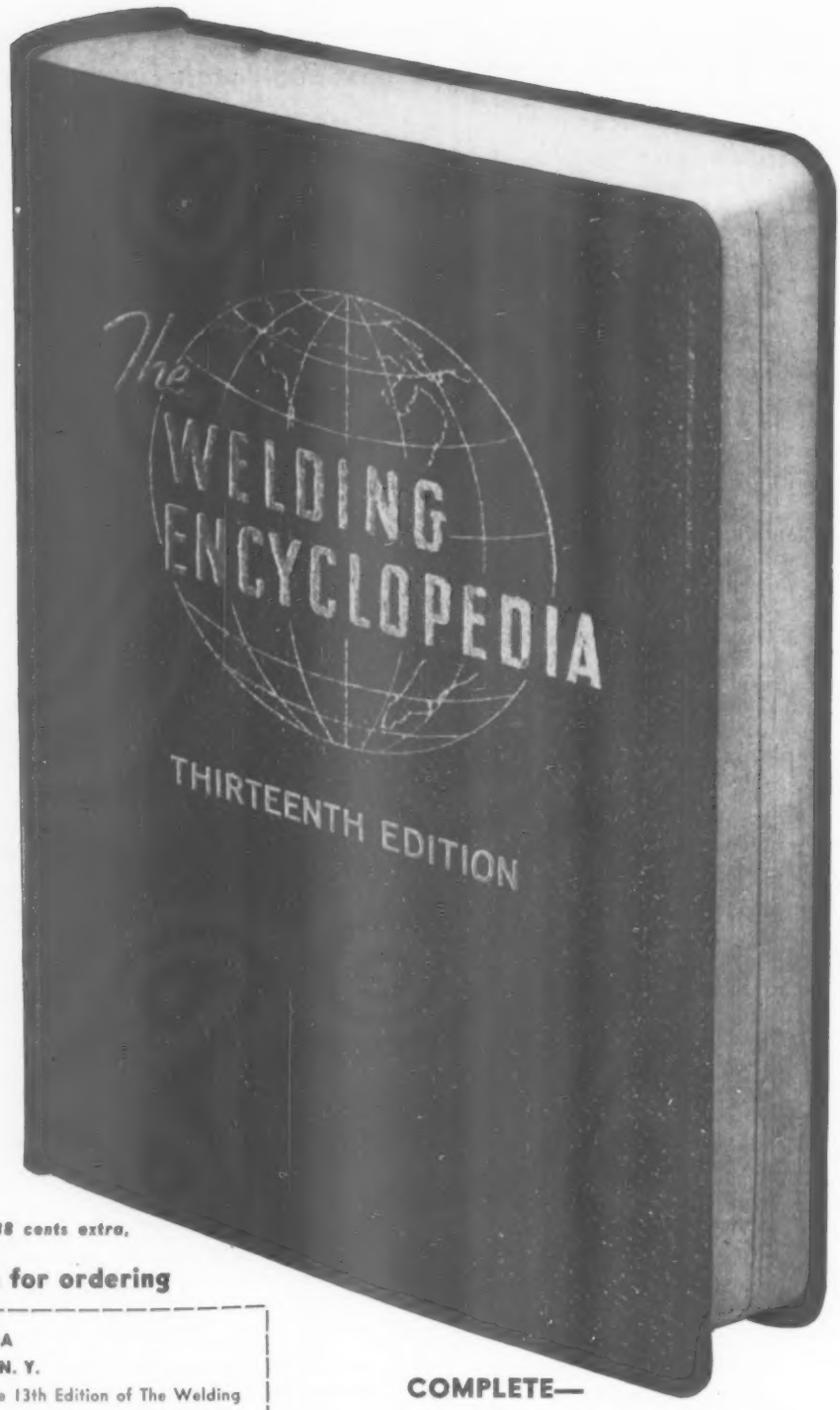

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1. Case hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

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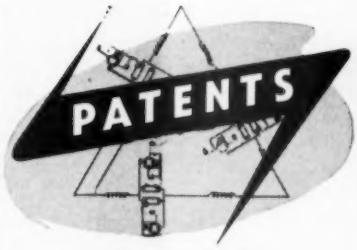
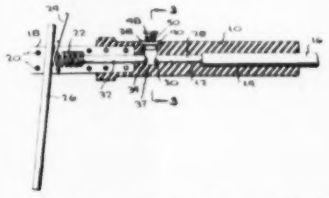


Safety Switch

2,655,580. ANDREW T. TETRAULT, Indian Orchard, Mass. Filed Dec. 14, 1951. Granted Oct. 13, 1953.



A newly patented safety switch for an electric welding holder includes a holder body having a longitudinal bore and a transverse passage communicating with, and extending laterally from, the bore. The passage has a closed inner end and an outer end opening upon the outer surface of the body. A pair of electrically conductive bars is arranged coaxially within the bore. These bars have spaced, opposite beveled ends projecting into the passage and spaced from the inner end of the passage. A stem of insulating material is mounted within the passage to slide transversely of the body toward and away from the bars. Its opposite ends are disposed within and without the body. A mounting plate is fixed to the holder body and has an opening registering with the passage. The opening's diameter is smaller than that of the passage. A spring is interposed between, and secured at, its opposite ends to the plate and to the outer end of the stem. The stem is normally biased outwardly of the body away from the bars. An electrically conductive contact on the inner end of the stem has its opposite sides formed complementarily to the bevels of the ends of the bars. It is adapted to bridge the bar ends upon depression of the stem against the action of the spring for closing of an electrical circuit through the bars. The space between the inner end of the passage and bar ends provides an open area into which the stem is shiftable on wearing of the bar ends. The contact is enlarged relative to the stem and engages against the edge of the opening of the plate by biasing the stem outwardly of the body. This limits movement of the stem away from the bars.

ARCAIR TORCH takes a "bite" out of Atom Apple

In the construction of the 225 foot diameter "Atom Apple" for the Atomic Energy Commission by the Chicago Bridge and Iron Company, six ton steel plates of ASM A201 grade B Firebox material were joined together with over 25,000 feet of manual and automatic welding.

Imperfect welds in the steel plate (varying from 1.02 inch to 0.90 inch in thickness) were gouged out with ARCAIR cutting and gouging Torches.

Welds joining the steel plates were required to have 100% penetration. All welds were X-rayed and those found to have less than perfect penetration were rejected. Rejects averaged from one to two percent.

The Chicago Bridge and Iron Company used ARCAIR Torches to gouge out defective welds during construction of the two million dollar Hortonsphere near West Milton, N. Y.

This is where the ARCAIR cutting and gouging Torch came in!

It was found that the ARCAIR method removed slag as well as weld metal, did not cover the defects and left a clean groove ready for re-welding without further chipping or grinding.

Five ARCAIR Torches were in use at one time on this job, not only in gouging operations, but also to take off strongbacks and scaffolding framework no longer needed. The contractor found the ARCAIR Torch "a real boon to construction workers."

Foundries, metal fabricators and maintenance shops throughout the country use the ARCAIR cutting and gouging Torch to solve their metal removing problems. The ARCAIR method cuts costs up to 80% over other metal cutting and gouging methods. Ask your welding supply dealer for a free demonstration in your plant.

Write for Free Bulletin with facts and photographs of other time and money-saving applications of the ARCAIR Torch. Arcair Company: *EASTERN DIVISION*, 423 So. Mt. Pleasant Ave., Lancaster, Ohio; *WESTERN DIVISION*, P. O. Box 4107, Bremerton, Wash.

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Cuts all metals—using only electric arc and compressed air

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Condensed Versions of ALL an Operator Needs to Know to Swing to

EASIER WAYS

of Welding, Brazing, Soldering, Tinning, Cutting

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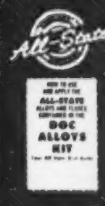
"I've checked the "How to Use and Apply" folder I want.



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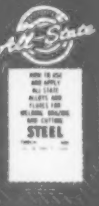


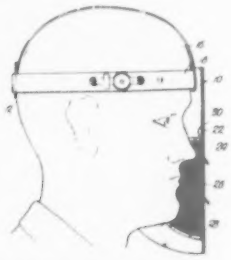
Name_____

Address_____

Company_____

Vented Face Shield

2,655,656. WILLIAM C. MOELLER, Kansas City, Mo. Assigned to Parmelee Plastics Co., Kansas City, Mo. Filed Feb. 18, 1952. Granted Oct. 20, 1953.

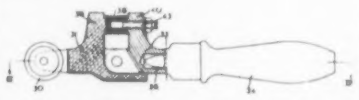


This patent concerns a face protector for weldors that has a bowlike shield of transparent material with louvered vent openings. A porous panel is mounted on the inside of the shield, covering the vents.

* * *

Spot-Welding Tool

2,656,446. ADRIEN ALBARRANC, Paris, France. Filed May 15, 1951. Granted Oct. 20, 1953.



A portable spot-welding tool comprising a handle, an electrode and an electrode holder is covered by this patent. The holder is secured to the handle and is in alignment with it when in the operating position. A spring pulls the holder into an angular position away from the handle when inoperative. One contact piece is carried by the holder, another by the handle. They engage when the holder aligns with the handle.

* * *

Cutting Torch

2,657,650. ALFRED F. CHOUINARD and JOHN B. LA POTA, Chicago. Assigned to National Cylinder Gas Co., Chicago. Filed May 21, 1947. Granted Nov. 3, 1953.

This patent refers to a torch for cutting stainless steel. The cutting tip has a central high-pressure oxygen passage and a ring-shaped row of passages for the preheating flames. A sleeve encircles the delivery end of the tip and has a similar ring-shaped row of converging discharge passages. A device for engaging the sleeve and tip insures a staggered position of the two rows of passages.

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1 OXYGEN PLANT, Air Products, 600 cu. ft. per hour, complete, liquid pump type, used slightly but completely overhauled by factory—$8,500.00
15 Kiddie Type 2 Wheel Trailer Fire Extinguishers pith 6 each 50 lb. and 2 each 15 lb. CO_2 fire ext. and 90 ft. hose. Complete, never used—$395.00 each
1 O2-B Oxygen Column Only, 1,000 cu. ft. per hour capacity. $1,800.00
1 Nordberg Air Compressor, 1000 PSI, 5000 cu. ft. per hour, run less than 100 hours—$2,500.00
1 Nordberg Oxygen Compressor, 2250PSI, 1500 cu. ft. per hour, run less than 100 hours—$2,500.00
4 Oxygen Compressor, Curtis, new, 2250 PSI, 750 cu. ft. per hour—$750.00 each

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Advertisers In This Issue

This advertisers' index is included as a convenience and is in no way part of the advertising contract. Although every care has been taken to index accurately, some errors may have occurred and no allowance will be made for them.

A

Air Reduction Sales Co. binds bet. 32-35
Allen Co., L. B. 96
Alloy Rods Company 12
All-State Welding Alloys Co., Inc. 96
American Brass Co., The 21
American Chain & Cable Co., Inc. 73
American Ind. Safety Equip. Co. 84
American Optical Company 16
American Platinum Works, The 17
American Welding Society 65
Ames Spot Welder Co., Inc. 22-23
Ampco Metal, Inc. 79, 82
Amperex Electronic Corp. 77
Arcair Company 95
Atlas Welding Accessories Co. 18

B

Becker Bros. Carbon Co. 90
Burdett Oxygen Co., The 27

C

Cam-Lok Div. of Empire Products, Inc. 79
Chicago Boiler Company 95
Chicago Hdwe. Foundry Co. 91
Crucible Steel Co. of America 19

E

Erico Products, Inc. 83
Eutectic Welding Alloys Corp. 85

G

Gasflux Company 93
General Electric Company 14-15
Goldsmith Bros. Smelting & Refining Co. 87
Grand Specialties Co. 86

H

Harnischfeger Corp. 8-9
Harris Calorific Co., The 32
Hewitt-Robins, Inc. 24-25
Hobart Bros. Co. 1

I

Independent Eng. Co., Inc. 88
International Nickel Co., Inc. 67
Invincible Vacuum Cleaner Mfg. Co. 20

J

Jackson Products Inside Front Cover

K

K-G Equipment Co., (Inc.) 86

L

Lapeer Mfg. Company 93
Lincoln Electric Company, The 36
Lindberg Engineering Company 35
Linde Air Products Co., A Div. of Union Carbide & Carbon Corp. 63, 81

M

Mallory & Co., Inc., P. R. 68
Metal Bond Mfg. Co. 95
Metal & Thermit Corp. 26
Miller Electric Mfg. Co. 10
Modern Engineering Co. 72
Mullenbach Elec. Mfg. Co. 82

N

National Carbide Corp. 72
National Cylinder Gas Company 29
National Welding Equipment Co. 7

O

Oxo Welding Equipment Co. 80

P

Page Steel & Wire Division 73
Pennsylvania Optical Company 13
Phoenix Products Corp. 84
Pierce Governor Co., Inc., The 91

R

Racine Glove Company 90

S

Sellstrom Mfg. Company 91
Shawinigan Products Corp. 92
Sight Feed Generator Company 92
Smith Corp., A. O. Back Cover
Smith & Sons, Inc., G. W. 78
Smith Welding Equipment Corp. 92
Steel Sales Corp. 88
Stoody Company 75
Stulz Sickles Company 78
Sylvania Electric Products 28

T

Taylor Winfield Corp. 89
Tempil Corp. 80
Thermacote Company 86
Tube Turns, Inc. Binds bet. 66-67
Tweco Products Co. Inside Back Cover
Union Carbide & Carbon Corp. Linde Air Products Co. 63, 81

U

United Wire & Supply Corp. 71

V

Victor Equipment Co. 4, 38

W

Wagner Mfg. Company 11
Welding Alloys Mfg. Co. 90
Welding Fittings Corp. 2
Westinghouse Electric Corp. 30-31

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
Positions Vacant 96
Selling Opportunities Offered 96

EDUCATIONAL
Schools 97

EQUIPMENT
(Used or Surplus New)
For Sale 97

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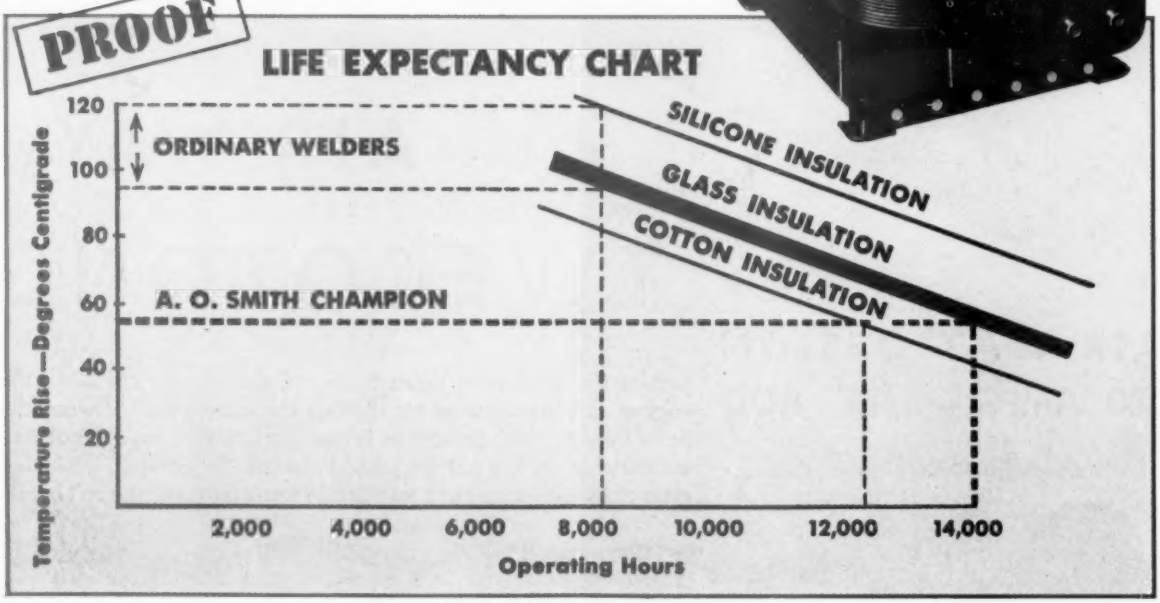

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